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COMMON SEA SHELLS AND SKELETONS OF SEA ANIMALS

1. Spotted cone. 2. Giant sea star. 3. Rosy coral. 4. Pearly nautilus. 5. Sea urchin. 6. Red ear. 7. Giant conch. 8. Brain coral. 9. Marlin spike. 10. Trapeze shell. 11. Turk's cap. 12. Bleeding tooth. 13. Red spotted mitre. 14. Black rock shell. 15. Pearl oyster. 16. White rock shell.

WINSTON'S
CUMULATIVE LOOSE-LEAF
ENCYCLOPEDIA
A COMPREHENSIVE REFERENCE WORK

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In Ten Volumes

ILLUSTRATED WITH PHOTOGRAPHS, MAPS, DRAWINGS AND COLOR PLATES; INCLUDING SEVEN COLOR PLATES FROM THE J. L. G. FERRIS COLLECTION OF AMERICAN HISTORICAL PAINTINGS, BY SPECIAL PERMISSION OF THE ARTIST

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CHICAGO PHILADELPHIA TORONTO

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KEY TO PRONUNCIATION

Three methods are used to indicate the pronunciation of the words forming the headings of the separate articles:

(1) By dividing the word into syllables, and indicating the syllable or syllables to be accented. This method is followed where the pronunciation is entirely obvious. Where accent marks are omitted, the omission indicates that all syllables are given substantially the same value.

(2) Where the pronunciation differs from the spelling, the word is re-spelled phonetically, in addition to the accentuation.

(3) Where the sound values of the vowels are not sufficiently indicated merely by an attempt at phonetic spelling, the following system of diacritical marks is additionally employed to approximate the proper sounds as closely as may be done:

ā, as in f*a*te, or in b*a*re.
ä, as in *a*lms, Fr. *â*me, Ger. B*a*hn=â of Indian names.
å, the same sound short or medium, as in Fr. b*a*l, Ger. M*a*nn.
a, as in f*a*t.
ą, as in f*a*ll.
a, obscure, as in rur*a*l, similar to *u* in b*u*t, ė in h*e*r: common in Indian names.
ē, as in m*e*=*i* in mach*i*ne.
e, as in m*e*t.
ė, as in h*e*r.
ī, as in p*i*ne, or as *ei* in Ger. M*ei*n.
i, as in p*i*n, also used for the short sound corresponding to ē, as in French and Italian words.
eu, a long sound as in Fr. je*û*ne, = Ger. long *ö*, as in Söhne, Göthe (Goethe).
eu, corresponding sound short or medium, as in Fr. p*eu*=Ger. *ö* short.
ō, as in n*o*te, m*oa*n.
o, as in n*o*t, fr*o*g—that is, short or medium.
ö, as in m*o*ve, tw*o*.
ū, as in t*u*be.
u, as in t*u*b: similar to ė and also to *a*.
ų, as in b*u*ll.
ü, as in Sc ab*u*ne=Fr. *û* as *i*n d*û*, Ger. *ü* long as in grün, Bühne.
ů, the corresponding short or medium sound, as in Fr. b*u*t, Ger. Müller.
oi, as in *oi*l.
ou, as in p*ou*nd; or as *au* in Ger. H*au*s.

The consonants, b, d, f, h, j, k, l, m, n, ng, p, sh, t, v, and z, when printed in Roman type, are always given their common English values in the transliteration of foreign words. The letter c is indicated by s or k, as the case may be. For the remaining consonant sounds the following symbols are employed:

ch is always as in ri*ch*.
d, nearly as *th* in *th*is = Sp. *d* in Ma*d*rid, etc.
g is always hard, as in *g*o.
h represents the guttural in Scotch lo*ch*, Ger. na*ch*, also other similar gutturals.
n̨, Fr. nasal *n* as in bo*n*.
r represents both English *r*, and *r* in foreign words, in which it is generally much more strongly trilled.
s, always as in *s*o.
th, as *th* in *th*in.
th, as *th* in *th*is.
w always consonantal, as in *w*e.
x = ks, which are used instead.
y always consonantal, as in *y*ea (Fr. *ligne* would be re-written lēny).
zh, as *s* in plea*s*ure = Fr. *j*.

WINSTON'S CUMULATIVE LOOSE-LEAF ENCYCLOPEDIA

VOLUME VIII

Perfect Number, a number the sum of whose aliquot parts is equal to the number itself, as, 28=1+2+4+7+14. A defective number is one the sum of whose aliquot parts is less than the number, as, 16: 1+2+4+8 =15. An abundant number is one the sum of whose aliquot parts is more than the number, as, 18: 1+2+3+6+9=21.

Perfumes (per'fūmz), substances emitting an agreeable odor, and used about the person, the dress, or the dwelling. Perfumes of various sorts have been held in high estimation from the most ancient times. The Egyptians, Hebrews, Phœnicians, Assyrians and Persians are known to have made great use of them, as did also the Greeks and Romans. In the middle ages France and Italy were most conspicuous for the use and preparation of perfumes. Perfumes are partly of animal but chiefly of vegetable origin. They may be divided into two classes, crude and prepared. The former consist of such animal perfumes as musk, civet, ambergris, and such vegetable perfumes as are obtained in the form of essential oils. The prepared perfumes, many of them known by fancy names, consist of various mixtures or preparations of odorous substances made up according to recipe. At the present time the manufacture of perfumes is chiefly carried on in Paris and London, and in various towns near the Mediterranean, especially in the south of France. Certain districts are famous for certain productions; as Cannes for its perfumes of the rose, tuberose, cassia, jasmine; Nîmes for thmye, rosemary and lavender; Nice for the violet and mignonette. England claims the superiority for her lavender, which is cultivated upon a large scale at Mitcham in Surrey. The seat of the production of otto of roses is Bulgaria, especially in the cantons of Kezanlik and Karlova. Of late years chemists have succeeded in producing a variety of artificial odoriferous substances, some identical with plant perfumes, others yielding new odors. Thus artificial musk differs widely in odor from true musk, but it is a delightful perfume, with many applications in perfumery. The artificial musk perfume is obtained from a mixture of isobutyl chloride and toluene, which is later treated with nitric acid. Otto of Rose has been duplicated by English chemists with the geraniol from citronella oil as a starting point. Perfumes and cosmetics are produced in considerable quantities in the U. S., the manufactures amounting to about $70,000,000.

Pergamus (pėr'ga-mus), or PERGAMUM, an ancient city in the west of Asia Minor, north of Smyrna, on the Caïcus. It was founded by emigrants from Greece, and rose to importance about the commencement of the third century B.C., when it was made the capital of an independent state, which subsequently became a Roman province. Pergamus was one of the most magnificent cities of antiquity. Many fine remains still exist in evidence of its former grandeur, and valuable results have been obtained through excavations carried out by the Prussian government. The modern town Bergama (which see) occupies its site.

Pergola (pėr'gō-la), a term adopted from the Italian for an arbor of trellis work over which are trained vines, and especially for such an arbor covering a path, walk, or veranda.

Pergolesi (per-go-lā'sē), GIOVANNA BATTISTA, an Italian musical composer, born at Jesi in 1710; studied at the conservatory of music at Naples; produced his first oratorio and his first opera in 1731; led a life of notorious profligacy; and died at Pozzuoli in March, 1736. His compositions are regarded as the best representations of his period.

Perianth (per'i-anth), in botany, the floral envelope, the calyx and corolla, or either. This term is applied when the calyx and corolla are combined so that they cannot be satisfactorily distinguished from each other, as in many monocotyledonous plants, the

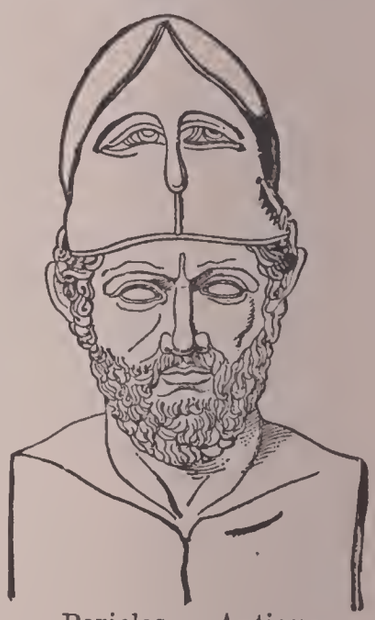
tulip, orchis, etc. The perianth is called *single* when it consists of one verticil, and *double* when it consists of both calyx and corolla.

Pericarditis (per-i-kar-dī′tis), inflammation of the membraneous sac (pericardium, which see) containing the heart. In the acute stage of the disease there is exudation of lymph or serum; at a later stage false membranes are formed, and at a still later stage the two sides become glued together, forming adherent pericardium. This is generally followed by changes in the substance of the heart, or in its internal surface, orifices, or valves, and a fatal termination is rarely long delayed. The symptoms of pericarditis are: 1st, pain more or less acute in the location of the heart; fever is present with loss of appetite and dry tongue. An anxious respiration and a feeling of overwhelming oppression are also present, with frequent sighing, which gives momentary relief. Most of the symptoms are aggravated by motion or a high temperature. For the diagnosis of pericarditis we must rely mainly on the physical signs, but it is only when the effusion is considerable that investigation by percussion is of much use. In ordinary cases, where adhesion takes place, there may be an apparently complete recovery at the end of three weeks or less; but adhesion frequently gives rise to other structural changes of the heart, and then fatal disease of that organ almost always follows. In slight cases a real cure without adhesion may be effected. This disease is frequently brought on by exposure to cold or draughts when the body is warm and perspiring. Its most frequent occurrence is in connection with acute rheumatism.

Pericardium (per-i-kar′di-um), the investing fibro-serous sac or bag of the heart in man and other animals. In man it contains the heart and origin of the great vessels. It consists of two layers, an outer or *fibrous*, and an inner or serous layer. The inner surface of the membrane secretes a serous fluid, which in health is present only in sufficient quantity to lubricate the heart, and so to facilitate its movements within the sac.

Pericarp (per′i-karp), in botany, the seed-vessel of a plant, or the whole case or covering in which the seed is inclosed. The pericarp often consists of very distinct layers, as in the plum, in which the external skin forms the *epicarp*, the pulp or flesh the *sarcocarp*, and the stone which encases the seed the *endocarp*. Pericarps receive such names as capsule, silique, legume, drupe, berry, nut, cone, etc.

Pericles (per′i-klēz), one of the most celebrated statesmen of ancient Greece, born at Athens about 494 B. C. He was connected by family relations with the aristocracy, but as Cimon was already at its head he endeavored to gain the favor of the popular party. In this he fully succeeded by his eloquence, abilities, and political tactics, so that on the death of Cimon, in 449 B. C., Pericles became virtual ruler of Athens. By his great public works he flattered the vanity of the Athenians, while he beautified the city and employed many laborers and artists. His chief aim was to make Athens undoubtedly the first power in Greece, as well as the chief center of art and literature, and this position it attained and held for a number of years. (See *Greece.*) At the commencement of the Peloponnesian war (B. C. 431), in which Athens had to contend against Sparta and other states, Pericles was made commander-in-chief. The Spartans advanced into Attica, but Pericles had made the rural population take refuge in Athens and refused battle. After they retired he led an army into Megaris, and next year he commanded a powerful fleet against the Peloponnesus. In 430 B. C. a plague broke out in Athens, and for a brief period Pericles lost his popularity and was deprived of the command. The people, however, soon recalled him to the head of the state, but amid his numerous cares he was afflicted by domestic calamities. Many of his friends, and his two sons, Xanthippus and Paralus, were carried off by the plague; and to console him for this loss the Athenians allowed him to legitimize his son by Aspasia. He now sunk into a lingering sickness, and died B. C. 429, in the third year of the Peloponnesian war. Pericles was distinguished by intellectual breadth, elevated moral tone, unruffled serenity, and superiority to the prejudices of his age. His



Pericles.— Antique bust.

name is intimately connected with the highest glory of art, science, and power in Athens.

Peridote (pėr'i-dōt), a name given by jewelers to the green transparent varieties of olivine. It is usually some shade of olive-green or leek-green. Peridote is found in Brazil, Ceylon, Egypt, and Pegu. It is a very soft gemstone, difficult to polish, and, when polished, liable to lose its luster and to suffer by wear.

Périer (pā-ri-ā), CASIMIR, a French statesman, was born at Grenoble in 1777; educated at Lyons, and served with honor in the campaigns of Italy (1799 and 1800). In 1802 he established a prosperous banking house in company with his brother. In 1817 he was elected to represent the department of the Seine in the Chamber of Deputies. Here he became one of the leaders of the opposition under Charles X, and was distinguished as an eloquent advocate of constitutional principles and an enlightened financier. After the revolution of 1830 he was prime-minister to Louis Philippe. Died in 1832. His grandson, of the same name, was President of France, 1894–95.

Perigee (pėr'i-jē), that point in the orbit of the moon which is at the least distance from the earth. See *Apogee.*

Périgord (pā-ri-gōr), an old province of France. It formed part of the military government of Guienne and Gascony, and is now represented by Dordogne and part of Lot-et-Garonne.

Périgueux (pā-ri-*geu*), a town of France, formerly capital of Périgord, now chief town of the department of Dordogne, on the right bank of the Isle, 68 miles E.N.E. of Bordeaux. There are bombazine and serge factories, iron and copper foundries, and a large trade in flour, wine, brandy, and the famous truffle *pâtés de Périgord.* Pop. (1911) 33,548.

Perihelion (pėr-i-hē'li-on; Greek, *peri*, near, and *hēlios*, the sun), that part of the orbit of the earth or any other planet in which it is at the point nearest to the sun. The 'perihelion distance' of a heavenly body is its distance from the sun at its nearest approach.

Perim (pā-rēm'), an island in the Strait of Bab-el-Mandeb, at the entrance to the Red Sea, about 10 miles from the Abyssinian and 1½ mile from the Arabian shore; 7 sq. miles in area. It has been held by Great Britain since 1857, and is under the government of Aden. It is of consequence from its commanding position, which renders it the key of the Red Sea. On its southwest side is a well-sheltered harbor capable of containing a fleet of warships.

Perimeter (pe-rim'i-tėr), in geometry, the bounds or limits of any figure or body. The perimeters of surfaces or figures are lines; those of bodies are surfaces.

Period (pē'ri-ud), in astronomy, the interval of time occupied by a planet or comet in traveling once around the sun, or by a satellite in traveling around its primary.

Periodicals (pē-ri-od'i-kalz), publications which appear at regular intervals, and whose principal object is not the conveyance of news (the main function of newspapers), but the circulation of information of a literary, scientific, artistic, or miscellaneous character, as also criticisms on books, essays, poems, tales, etc. Periodicals exclusively devoted to criticism are generally called *reviews*, and those whose contents are of a miscellaneous and entertaining kind *magazines;* but there is no great strictness in the use of the terms. The first periodical was published in France, being a scientific magazine, the *Journal des Savants*, issued in 1665, and still existing in name at least. The most famous French literary periodical is the *Revue de Deux Mondes*, begun in 1829, from 1831 issued fortnightly, and marked by an ability which has placed it in the front rank of the world's periodicals. Into it tales, poems, etc., are admitted, and the names of the contributors have to be attached to their articles. The earliest English periodical seems to have been the *Weekly Memorials for the Ingenious*, the first number of which is dated January, 1681–82, and which lasted but a year. It was followed by several other periodicals, which for the most part had but a brief existence. In the 18th century a number of monthly reviews appeared, including the *Monthly Review* (1749–1844); the *Critical Review* (1756–1817); the *British Critic* (1793–1843); the *Anti-Jacobin Review and Magazine* (1798–1821). At length in 1802 a new era in criticism was introduced by the *Edinburgh Review*, the organ of the Whigs, which came out every three months, and soon had a formidable rival in the *Quarterly Review* (1809), the organ of the Tories. In 1824 the *Westminster Review* was started by Bentham as the organ of utilitarianism and radicalism, and with it was afterwards incorporated the *Foreign Quarterly Review* (1827–46); and in 1836 the *Dublin Review* was established

as the organ of the Roman Catholic party. All the quarterlies still exist, with various monthly reviews of later date.

Passing over the *Tatler* (1709–10), *Spectator* (1711–12, revived 1714), etc., what should be considered to be *sui generis*, the first English magazine properly speaking may be said to be the *Gentleman's Journal, or Monthly Miscellany*, commenced in 1692. It was followed in 1731 by the *Gentleman's Magazine*, published by Cave. The success of Cave's venture brought out a host of imitators, the *London Magazine* (1732–84), the *Scots Magazine* (1739–1817), the *European Magazine* (1782–1826), and the *Monthly Magazine* (1796–1829), being among the chief of this class which were originated in the 18th century. To these a large number has since been added. Germany, Russia, the United States, and other countries were later in embarking actively in periodical publications, but the United States now stands first in activity in this field. The *North American Review*, the oldest of these, began as a quarterly in 1815, and is now published as a monthly. There followed the *Atlantic*, the finely illustrated *Harper's*, *Scribner's*, and *Century* magazines, the *Popular Science Monthly*, and a host of others of more recent date. The United States has no counterpart of the British reviews, but in lighter magazine literature has no rival in number and circulation of periodical publications.

Periodicity (pē-ri-u-dis'i-ti), the disposition of certain things or phenomena to recur at stated periods. It denotes the regular or nearly regular recurrence of certain phenomena of animal life, such as sleep and hunger. The first indication of a diseased state is generally a disturbance of the natural or acquired periodicity of the various functions of life.

Periosteum (per-i-os'tē-um), the fibrous membrane investing the bones, and which serves as a medium for the transmission of the nutritive bloodvessels of the bone. The periosteum firmly adheres to the surface of bones (including the inside of the long bones), save at their gristly or cartilaginous extremities, and it becomes continuous with the tendons or ligaments inserted into bones. When the periosteum, through disease or injury, becomes affected the blood supply and nutrition of the bone suffer, and in consequence the bone-tissue dies or becomes *necrosed*, and is exfoliated or thrown off. When a bone is fractured the periosteum plays an important part in the repair of the injury, new osseous material being deposited by the membrane.

Periostitis (per-i-os-tī'tis), inflammation of the periosteum, a painful ailment frequently brought on by sudden exposure to cold after being heated.

Peripatetic Philosophy (per-i-pa-tet'-ik), the philosophy of Aristotle and his followers, so-called, it is believed, because he was accustomed to walk up and down with his more intimate disciples while he expounded to them his doctrines (Greek, *peri*, about, *patein*, to walk). The philosophy of Aristotle starts from his criticism of the Platonic doctrine of ideas, in combating which he is led to the fundamental antithesis of his philosophy, that between matter and form. The notion or idea of a thing is not, he says, a separate existence, different from the thing itself, but is related to the thing only as form to matter. Every sensible thing is a compound of matter and form, the matter being the substance of which the thing consists, while the form is that which makes it a particular thing (a stone, for example, and not a tree), and therefore the same as its notion or idea. The form is the true nature of a thing. Origination is merely matter acquiring form, it is merely a transition from potential to actual existence. Everything that actually exists previously existed potentially in the matter of which it is composed. Matter is thus related to form as potentiality to actuality. And as there is, on the one hand, formless matter, which is mere potentiality without actuality, so, on the other hand, there is pure form which is pure actuality without potentiality. This pure form is the eternal Being, styled by Aristotle the first or prime mover. The whole of nature forms a scale rising from the lower to the higher of these extremes, from pure matter to pure form, and the whole movement of nature is an endeavor (incapable of realization) of all matter to become pure form. Motion is the transition from the potential to the actual. Space is the possibility of motion. Time is the measure of motion. According to his physical conception the universe is a vast sphere in constant motion, in the center of which is our earth. On this earth, as in all nature, there is a regular scale of beings, the highest of which is man, who, to nutrition, sensation, and locomotion, adds reason. The soul, which is merely the animating principle of the body and stands to the body in the relation of form to matter, cannot be thought of as separated from the

body; but the reason is something higher than that, and as a pure intellectual principle exists apart from the body, and does not share in its mortality. Practical philosophy is divided by Aristotle into ethics, economics, and politics. According to his ethical system the highest good is happiness, which depends on the rational or virtuous activity of the soul throughout life. Virtue is proficiency in willing what is conformed to reason. All virtues are either ethical or dianoetic. The former include justice or righteousness, generosity, temperance, bravery, the first being the highest. The dianoetic virtues are reason, science, art, and practical intelligence. For the attainment of the practical ends of life it is necessary for man to live in society and form a State.

The school of Aristotle (the Peripatetic school) continued at Athens uninterruptedly till the time of Augustus. Those who proceeded from it during the first two or three centuries after his death abandoned, for the most part, the metaphysical side of Aristotle's teaching, and developed chiefly his ethical doctrines, or devoted themselves to the study of natural history. Later Peripatetics returned again to the metaphysical speculations of their master, and many of them distinguished themselves as commentators on his works. No one of the philosophical schools of antiquity maintained its influence so long as the Peripatetic. The philosophy of the Arabians was almost exclusively Aristotelianism, that of the schoolmen (scholasticism) was also based on it, and even down to modern times its principles served as the rule in philosophical inquiries.

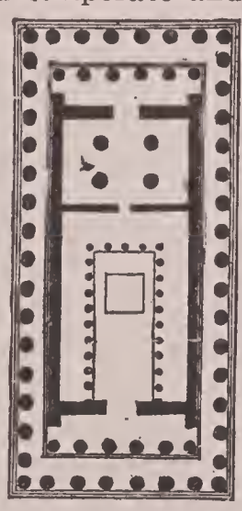
Periploca (per-ip'lo-ca), a genus of climbing plants belonging to the natural order Asclepiadaceæ, natives of South Europe and temperate and subtropical Asia, one being found in tropical Africa.

Periplus (per'i-plus; Gr. 'a sailing around'), a term applied particularly to the voyage of Africaya Hanus (which see).

Peripneumonia.

See *Pneumonia.*

Peripteral (pe-rip' tėr-al), in Greek architecture, a term signifying surrounded by a row of columns; said of a temple or other building, especially of a temple the cella of which is surrounded by columns, those on the flanks (or sides) being distant one intercolumniation from the wall.



Plan of Peripteral Temple.

Peris (pē'rez), in Persian mythology, the descendants of fallen spirits excluded from paradise until their penance is accomplished. They belong to the family of the genii or jin, and are constantly at war with the Dēvs (the evil jin.) They are immortal, and spend their time in all imaginable delights.

Periscope (per'i-scōp), an apparatus adapted to rise above the water from a submerged submarine and reveal the position of surrounding vessels. This is usually a reflecting prism, which can be revolved to any angle.

Perissodactyla (per-is-o-dak'ti-la; Greek, *perissos*, odd, uneven; *daktylos*, finger or toe), one of the two great divisions of the order of Ungulata or Hoofed Quadrupeds, the animals included in which are distinguished by the fact that the toes, numbering one or three, are odd or uneven in number. This term is opposed to the Artiodactyla or 'Even-toed' Ungulata. The horse, tapir, and rhinoceros comprise the three existing genera.

Peristaltic Motion (per-i-stal'-tik), also called VERMICULAR, the name given to certain movements connected with digestion observed in the stomach and intestines, which proceed with a wave-like or spiral motion, the object being to gradually propel forwards the contents of these viscera.

Peristyle (per'i-stīl), in architecture, a range of columns surrounding the exterior or interior of anything, as the cella of a temple. It is frequently but incorrectly limited in signification to a range of columns around the interior of a place, as, for example, an open court.

Peritoneum (per-i-tu-nē'um), the serous membrane lining the abdominal cavity and covering the intestines. Like all other serous membranes, the peritoneum presents the structure of a closed sac; one layer (*parietal*) lining the abdominal walls, the other or *visceral* layer being reflected over the organs of the abdomen. A cavity — the *peritoneal cavity* — is thus inclosed between the two layers of the membrane, and this contains in health a quantity of serous fluid just sufficient to moisten its surfaces.

Peritonitis (per-i-tu-nī'tis), inflammation of the peritoneum (which see). It is either acute or chronic, and the chronic form either sim-

ple or tubercular. It may be caused by injuries such as a blow or a wound piercing the belly; is often the result of ulcerations of the stomach or bowels, and of diseases of liver, kidneys, etc., and is sometimes a grave complication of puerperal fever. The symptoms are chiefly severe pain, increased by pressure, and fever. Emollient poultices and fomentations to the abdomen when the patient is able to bear their weight, bathing in tepid water, and small doses of opium are the means of cure resorted to. Fluid food is to be given — beef-tea, thin soup, milk, etc. For chronic cases nourishing diet is required, sea-air, friction of the belly with cod-liver oil, iodine treatment, etc.

Periwig. See *Wig*.

Periwinkle (per'i-wing-kl; *Vinca*), a genus of herbaceous or suffruticose plants of the natural order Apocynaceæ or Dog-bane family. The greater and lesser periwinkle (*Vinca major* and *Vinca minor*) are hardy plants, which blossom in early spring, and are pretty common in woods, hedges, and thickets in many parts of Europe and in the south of England. Their flowers are of a fine blue color, but when cultivated in gardens they may be made to yield purple and variegated flowers, both single and double.

Periwinkle (*Littorina*), a genus of mollusca very common on the British coasts. The shell is spiral, has few whorls, and is without a nacreous lining; the aperture is rounded and entire or unnotched (holostomatous). The common periwinkle (*L. littorea*) occupies the zone between high and low water marks, and is gathered and eaten in immense quantities. It is called the *wilk* in Scotland, in some parts simply the *buckie*, but is quite different from the mollusc called *whelk* (*Buccinum*) in England.

Perjury (pėr'ju-ri), the act or crime of willfully making a false oath in judicial proceedings in a matter material to the issue or cause in question. The penalties of perjury attach to willful falsehood in an affirmation made by a Quaker or other witness where such affirmation is received in lieu of an oath. Perjury is a misdemeanor punishable in England and the United States, at common law, by fine or imprisonment; in Scotland the punishment is penal servitude or imprisonment. Popularly, the mere act of making a false oath, or of violating an oath, provided it be lawful, is considered perjury.

Perm (pėrm), an eastern government of Russia, partly in Europe and partly in Asia; area, 128,211 sq. miles. It is traversed north to south by the Ural chain, and is well watered by rivers belonging to the Petchora, Tobol (affluent of the Obi), and Kama systems. North of the 60th degree regular culture becomes impossible, and the far greater part of the surface is occupied by forests and marshes. The government is rich in minerals, comprising iron, silver, copper, platinum, nickel, lead, and gold. There was formerly a principality of Perm, the Permians (a Finnish tribe) being under independent princes.— PERM, the capital of the government, is situated on the Kama, 930 miles northeast of Moscow. It has flourishing industries in iron, steel, leather, etc. In the neighborhood is a government manufactory of guns and munitions of war. Perm derives its commercial importance from being an emporium for the goods which are unshipped here from the steamers coming up the Kama, and despatched by rail, car, or sledge to Siberia. Pop. (1911) 61,614.

Permanganate (pėr-man'ga-nāt'), a compound of permanganic anhydride, Mn_2O_7, and a base. Potassic permanganate is used as a disinfectant, and as a chemical reagent.

Permian Formation (pėr'mi-an), in geology, a rock formation which received its name from covering an extensive area in the government of Perm, in Russia. It rests upon the carboniferous strata and forms the upper portion of the Primary or Palæozoic geological age; being followed by the Triassic, the first of the Secondary systems.

Permit (pėr'mit), a written permission given by officers of the customs or excise for conveying spirits and other goods liable to duties from place to place.

Permutations and Combinations. In mathematics, the different orders in which any things can be arranged are called their 'permutations.' The 'combinations' of things are the different collections that can be formed out of them, without regarding the order in which the things are placed. Thus the permutations of the letters *a*, *b*, *c*, taken two at a time, are *ab*, *ba*, *ac*, *ca*, *bc*, *cb*, being six in number. Their combinations, however, are only three, namely *ab*, *ac*, *bc*, and so in all cases the number of permutations exceeds the number of combinations. The theory of permutations and combinations is of

some importance from its bearings on that of probabilities.

Pernambuco (pėr-näm-bö'kō), a north-eastern state of Brazil, bounded N. by Ceara and Parahyba, E. by the Atlantic, S. by Alagoas and Bahia, and W. by Piauhy. Area, 49,573 sq. m.; pop. 1,178,150. It comprises a comparatively narrow coastal zone, a high inland plateau, and an intermediate zone formed by the terraces and slopes between the two. Its surface is much broken by the remains of the ancient plateau which has been worn down by erosion. The coastal zone is low, well-wooded and fertile. It has a hot, humid climate, relieved to some extent by the south-east trade winds. This region is locally known as the *mattas* (forests). The middle zone, called the *caatinga* or *agreste* region, has a dry climate and lighter vegetation. The inland region, called the *sertao*, is high, stony and dry, and frequently devastated by prolonged droughts (*seccas*). The climate is characterized by hot days and cool nights, and there are two clearly defined seasons, a rainy season from March to June, and a dry season for the remaining months. The rivers of the state include a number of small plateau streams flowing southward to the Sao Francisco River, and several large streams in the eastern part flowing eastward to the Atlantic. Pernambuco is chiefly agricultural, the lowlands being devoted to sugar and fruit, with coffee in some of the more elevated localities, the *agreste* region to cotton, tobacco, Indian corn, beans and stock, and the *sertao* to grazing and in some localities to cotton. The capital of the state is Recife, commonly known among foreigners as Pernambuco.

Perpendicular Style, Abbey Church, Bath.

Pernau (pėr'nou), a seaport town and watering-place in Russia, in the government of Livonia, at the entrance of the river Pernau into the Gulf of Riga. Pop. about 13,000.

Peronospora (pė-r-o-nos'po-ra), a genus of fungi, one species of which, *P. infestans* (otherwise *Botrytis infestans*), is said to be the cause of the potato disease.

Pérouse, La. See *La Pérouse.*

Peroxides (pėr-oks'īdz), the general name applied to the binary compounds of oxygen containing the greatest amount of that element; thus of the two oxides of hydrogen, H_2O and H_2O_2, the latter is the peroxide.

Perpendicular (pėr-pen-dik'ū-lar), in geometry, a line falling directly on another line, so as to make equal angles on each side. A straight line is said to be *perpendicular* to a curve when it cuts the curve in a point where another straight line to which it is perpendicular makes a tangent with the curve. In this case the perpendicular is usually called a *normal* to the curve.

Perpendicular Style, in architecture, a variety of the pointed Gothic, the latest variety to be introduced, sometimes called the *florid* or *Tudor* style of *Gothic*. It prevailed in England from about the end of the 14th to the middle of the 16th century. It is chiefly characterized by the predominance of straight lines in the design, and especially in its tracery. Another feature is the lofty square towers of its churches, divided into stages by bands, and each stage filled with windows. The mullions of the windows are vertical, generally rise to the main arches, and are often crossed by horizontal bars or transoms. Large windows are a distinctive feature of this style. The tracery of the doors is similar to that of the windows. There are two kinds of roof peculiar to the style—the vaulted roof, with fan-tracery, and the open timber-roof. Nearly all of the colleges of Oxford and Cambridge are specimens of it, and it is also exemplified more or less in many of the English cathedrals; while the majority of the old parish churches of England also are of the Perpendicular style.

Perpetual Motion (pėr-pet′ū-al), a motion that, once originated, continues for ever or indefinitely. The problem of a perpetual motion consists in the invention of a machine which shall have the principles of its motion within itself, and numberless schemes have been proposed for its solution. It was not till the discovery of the principle of the conservation of energy (see *Energy, Conservation of*), experimentally proved by Joule, that the impossibility of the existence of a perpetual motion was considered to be a physical axiom. This principle asserts that the whole amount of energy in the universe, or in any limited system which does not receive energy from without, or part with it to external matter, is invariable. But every machine when in action does a certain amount of work, if only in overcoming friction and the resistance of the air, and as the perpetual motion machine can start with only a certain amount of energy, this is gradually used up in the work it does. A machine, in short, to be perpetual, would need to be one with no friction, and which met with no resistance of any kind. The mechanical arrangements which have been put forward as perpetual motions by inventors are either, (1) Systems of weights, which are allowed to slide on a wheel into such positions relatively to the axis of the wheel as to produce a constant turning movement in one direction; (2) Masses of liquid moving in wheels on the same principle; (3) Masses of iron arranged on the same principle, but subjected to the attractions of magnets instead of their own weights. Numbers of patents for such machines have been taken out, but in every case inventors have shown an ignorance of the elementary principles of natural philosophy.

Perpignan (per-pēn-yän), a city of Southern France, capital of dep. Pyrénées-Orientales, on the Têt, about 7 miles from the Mediterranean. Guarding the entrance from Spain into France by the East Pyrenees, it is strongly fortified, has a citadel and other works, and ranks as a fortress of the first class. The city has much of the Spanish character. The principal building is the cathedral, founded in the 14th century. Perpignan was formerly the capital of the county of Roussillon, was long under Spanish rule, and was not united to France till the Treaty of the Pyrenes in 1659. Pop. (1911) 39,516.

Perrault (pā-rō), CHARLES, a French writer, born in 1628; died in 1703; best known for his *Mother Goose Stories*, first published in 1697.

Perry (pėr′ī), a town of Dallas Co., Iowa, 34 miles W. N. W. of Des Moines, in a farming and livestock section. It has machine shops, milk condensers, etc. Pop. (1920) 5642.

Perry, MATTHEW CALBRAITH, was born in S. Kingston, R. I., 1794; died in 1858. As commander (1826) he was on the recruiting service at Boston, and helped to organize the first naval apprentice system in the United States navy. He rendered distinguished service in the Mexican war (1846) and as commodore was despatched with a squadron to Japan in 1852. There, after many difficulties, he negotiated a treaty with that nation, safeguarding the rights of American commerce (1854).

Perry, OLIVER HAZARD, naval officer, brother of M. C. Perry, born at Newport, Rhode Island, in 1785. He was in the navy in the War of 1812, and in 1813 was sent to Lake Erie to build a fleet and seek to gain control of the waters of that lake. This he accomplished in a brilliant action, September 10, 1813, in which he annihilated the British fleet. Sent in 1819 as commander of a squadron to the West India waters, he died of yellow fever at Trinidad.

Persecutions (pėr-se-kū′shunz), the name usually applied to periods during which the early Christians were subjected to cruel treatment on account of their religion. Ten of these are usually counted. The *first persecution* (64–68) was carried on under Nero. The cruelties practiced on this occasion are worthy of the ferocious instincts of that notorious tyrant. The apostles Peter and Paul are supposed to have suffered in this persecution. The *second persecution* (95–96) took place under the Emperor Domitian. Many eminent Christians suffered, and it is generally held that St. John was exiled to Patmos at this time. The *third persecution* began in the third year of Trajan (100). This persecution continued for several years, with different degrees of severity in many parts of the empire, and the severity of it appears from the great number of martyrs mentioned in the old martyrologies. The *fourth persecution*, under Marcus Aurelius (161–180), at different places, with several intermissions and different degrees of violence, continued the greatest part of his reign. It raged with particular fury in Smyrna and Lyons, and Vienne in Gaul. Polycarp and Justin Martyr are famous victims of this period. The *fifth* began in 197 under Severus. During the *sixth persecution*, under Maximian (235–238), only Christian teachers and ministers

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THE AMERICAN COMMANDER-IN-CHIEF IN THE FIELD

Photograph of General John J. Pershing just after he had been decorated with the Star and Ribbon of the Legion of Honor of France, the highest decoration ever awarded an American soldier. General Pershing, together with General Peyton C. March and General Tasker H. Bliss, was raised to a full generalship soon after America entered the World War, an honor which has previously been held only by Washington, Grant, Sherman and Sheridan.

were persecuted. Decius began his reign (249) with a persecution of the Christians (the *seventh*) throughout his dominions. This was the first really general persecution. Valerian in 257 put to death few but the clergy (*eighth persecution*); and the execution of the edict of Aurelian against the Christians (274)—the *ninth persecution*, as it was called—was prevented by his violent death. A severe persecution of the Christians (the *tenth*) took place under the Emperor Diocletian (303). Throughout the Roman Empire their churches were destroyed, their sacred books burned, and all imaginable means of inhuman violence employed to induce them to renounce their faith. Persecutions, principally directed against the clergy, continued with more or less vigor until Constantine the Great (312 and 313) restored to the Christians full liberty and the use of their churches and goods; and his conversion to Christianity made it the established religion of the Roman Empire.

Persephone (pėr-sef'o-nē; Latin, *Proserpĭna*, Anglicized *Proserpine*), in Greek mythology, the daughter of Zeus and Dēmētēr (Ceres). While she was gathering flowers near Enna in Sicily Pluto carried her off to the infernal regions, with the consent of Zeus, and made her his wife, but in answer to the prayers of Dēmētēr she was permitted to spend the spring and summer of each year in the upper world. In Homer she bears the name of Persephoneia. The chief seats of the worship of Persephonē were Attica and Sicily. In the festivals held in her honor in autumn the celebrants were dressed in mourning in token of lamentation for her being carried off by Pluto, while at the spring festivals they were clad in gay attire in token of joy at her return.

Persepolis (pėr-sep'o-lis), a Persian city of great antiquity, famous for its magnificent ruins, situated in a fertile valley of the present province, Faristan. Its foundation is generally ascribed to Cyrus, but its history is involved in much doubt. It was one of Persia's capitals, and the place of burial for many of its monarchs; and it was the residence of Darius III when it was taken in 331 B. C. by Alexander the Great, who is said to have given it up to pillage and destruction, but this probably applies only to some of its principal palaces. The remains of large marble columns, vast portals, walls, huge figures, bas-reliefs, etc., amply prove the former extent and magnificence of its royal palace and temples.

Perseus (per'sūs), an ancient Greek hero, son of Danaë and Zeus.

Perseus, the last king of the Macedonians, son of Philip V, succeeded his father B. C. 178. The Romans defeated him at Pydna, 168 B. C.

Perseus, a northern constellation, surrounded by Andromeda, Aries, Taurus, Auriga, Camelopardalus, and Cassiopeia.

Pershing (pėr'shing), John Joseph (1860-), an American general, commander-in-chief of the American Expeditionary Forces in Europe from June, 1917. He was born in Linn county, Missouri, and graduated from the U. S. Military Academy in 1886. His record follows: First lieutenant, 6th U. S. Cavalry, 1886; first lieutenant, 10th Cavalry, 1901; brigadier-general, 1906; major-general, 1916; general, 1917. He served in the Apache Indian campaign, 1886; Sioux campaign, 1890-91; was military instructor at the University of Nebraska, 1891-95; instructor in tactics, U. S. Military Academy, 1897-98; served in the Santiago campaign, 1898; Philippine Islands, 1899-1903; on the General Staff, 1903-06; on duty in the Philippines as military-governor of Moro Province, 1909-13; commanded 8th Brigade, Presidio, Cal., 1914; commanded border districts, 1914-16. He was in command of the United States troops sent to Mexico in pursuit of Villa, 1916-17. Appointed commander-in-chief of the American Expeditionary Forces, he arrived in France, June, 1917, and commanded in person the reduction of the German salient at St. Mihiel (q. v.) and other successful operations in the European war (q. v.). He returned to the United States on September 8, 1919, and was given enthusiastic public welcome. His rank of general was made permanent. In 1921 he was appointed head of the War College and chief of staff of the United States Army.

Persia (per'shà, per'zhà; Persian, *Iran*), an independent state of Western Asia; bounded north by Transcaucasian Russia, the Caspian Sea, and Russian Central Asia; east by Afghanistan and Baluchistan; south by the Persian Gulf; and west by Asiatic Turkey; extending for 700 miles from N. to S. and 900 miles from E. to W.; area, about 628,000 sq. m.; pop. about 10,000,000. The country is divided into 27 provinces; capital, Teheran; chief trade centers, Teheran, Tabreez, Ispahan; chief ports, Bushire and Bender Abbas on the Persian Gulf. Other large towns are: Meshed, Baĭfroosh, Kerman, Yezd, Hamadān, Shirāz, Kazvin, Kom, Resht.

Physical Features.—Persia may be considered as an elevated plateau, broken by clusters of hills or chains of rocky

mountains, which alternate with extensive plains and barren deserts; the desert of Khorassan in the northeast alone absorbs about one-seventh of the entire area. Low tracts exist on the Persian Gulf and the Caspian Sea. The interior plains have an elevation of from 2000 to 6000 feet above the sea. This vast central plateau is supported in the N. and S. by two great mountain chains or systems, and from these all the minor ranges seem to spring. The north chain, an extension of the Hindu Kush, enters Persia from Northern Afghanistan, proceeds across the country, and reaches its greatest elevation on the south of the Caspian, where it takes the name of the Elburz Mountains, and attains in Mount Demavend a height of nearly 20,000 feet. Still further west it becomes linked with the mountains of Ararat. The other great mountain system runs from northwest to southeast nearer the Persian Gulf. is of considerable width, and forms several separate ranges. In one of these an elevation of 17,000 feet is reached. The rivers are few and insignificant. Not one of them is of any navigable importance, except the Euphrates, which waters only a small portion of the southwest frontier, and the Karun, recently opened to the navigation of the world. The latter is entirely within Persian territory, and flows into the Shat-el-Arab, or united Tigris and Euphrates. Of the streams which flow northwards into the Caspian the only important one is the Kizil-Uzen or Sefid Rud (White River), which has a course of about 350 miles. There are a great number of small fresh-water lakes, and a few very extensive salt lakes, the largest being Urumiah in the extreme northwest.

Climate, Products, etc.— The climate varies considerably in different provinces, and in the central plateau intense summer heat alternates with extreme cold in winter. The shores of the Persian Gulf are scorched up in summer; those of the Caspian Sea, especially the parts covered with dense forest, are humid, but also noted for malaria. The mineral wealth of Persia is but little developed. Iron, copper, lead, and antimony, are abundant; sulphur, naphtha, and rock-salt exist in great quantities; coal also exists. The turquoise mines of Nishapur are about the only ones receiving anything like adequate attention. The interior of Persia, particularly its eastern and southern regions, is mostly devoid of vegetation over large areas; the southwest has its forests of stunted oaks and other trees, and jungle; but on the Caspian the mountainsides are covered with dense and magnificent woods of oak, beech, elm, and walnut, intermingled with box-trees, cypresses, and cedars. Lower down wheat and barley are extensively cultivated. In the level and rich plains below, the sugar-cane and orange come to perfection; the pomegranate grows wild; the cotton-plant and mulberry are extensively and successfully cultivated, and large tracts are occupied by the vine and orchards producing every kind of European fruit. In the low plains the only grain under extensive and regular culture is rice; the principal subsidiary crops are cotton, indigo, opium, sugar, madder, and tobacco. Excellent dates are produced on the southern coast tracts. Irrigation is well understood and extensively practiced. The domestic animals are: sheep, chiefly of the large-tailed variety; goats, some of which produce a wool little inferior to that of Cashmere; asses and mules of a large and superior description; horses of Arab, Turkoman, and Persian breeds, and camels. Wild animals include the lion, leopard, wolf, jackal, hyena, bear, porcupine, wild ass, gazelle, etc.

Manufactures and Trade.— The manufactures of Persia were once celebrated, but excepting some carpets and shawls, it may be said that the country has ceased to export manufactured articles. Its chief exports now are rice, dried fruits, opium, silk, wool, cotton, hides, pearls, and turquoises. Chief imports: textiles, china and glass, carriages, sugar, tea, coffee, petroleum, drugs, and fancy articles. The internal trade of the country is almost entirely carried on by caravans. The total exports and imports are valued at about $60,000,000; the revenue is about $7,000,000; the foreign debt is $16,757,000. There are some 6500 miles of telegraph lines in operation, and a regular postal service was organized in 1877.

Government.— The government of Persia has long been an absolute monarchy, the only control to which its ruler, the Shah, was subject being the precepts of the Koran. He surrounded himself with a certain number of advisers, forming a ministry, eleven of whom were heads of special departments. These ministers he called and dismissed at pleasure. In 1906 a constitution and a legislative assembly were granted and Persia came in a measure within the circle of limited monarchies.

People.— The population is chiefly made up of Iranians or pure Persians and Turanians (Turkish and Tartar tribes), and in religion belongs almost exclusively

to the Shiah sect of Mohammedans, or more properly to a subdivision of that sect. The priesthood is very influential and very bigoted. Education is comparatively well attended to, Persia being considered, next to China, the best-educated country in Asia. The Persians are rather short and slenderly built, fair in complexion, hair long and straight, but beard bushy, and almost invariably jet black. The women are beautiful, intellectual, and polite. The Persian is celebrated for his affable manners, but also for his craft and deceit. Polygamy is both authorized and encouraged.

History.— The original country of the Persians occupied a small portion of modern Persia on the north of the Persian Gulf. After being under the Assyrians, and next under the Medes, Cyrus (B.C. 559–529), by conquering and uniting Media, Babylonia, Lydia, and all Asia Minor, became the founder of the Persian Empire. The empire was further extended by his son and successor Cambyses (B. C. 529–522), who conquered Tyre, Cyprus, and Egypt; and by Darius I, who subdued Thrace and Macedonia, and a small part of India. His son Xerxes (486–465 B. C.) reduced Egypt, which had revolted under his father, and also continued the war against the European Greeks, but was defeated on the field of Marathon and at Salamis (480 B.C.), and obliged to defend himself against the Greeks in a disastrous war. Artaxerxes I (B.C. 465–425) had a long and comparatively peaceful reign. Artaxerxes was followed by Darius II or Darius Nothus, Artaxerxes II (Mnemon), Artaxerxes III (Ochus), and Darius III (Codomannus, B. C. 338–330), the last of this dynasty, known as the Achæmenian dynasty. He was defeated by Alexander the Great in three battles, lost his life, and the empire passed into the hands of his conqueror. On the dissolution of the Macedonian Empire, after the death of Alexander (323), Persia ultimately fell to his general Seleucus and his successors the Seleucidæ (312). They reigned over it till 236 B. C., when the last Seleucus was defeated and taken prisoner by Arsaces I, the founder of the dynasty of the Arsacidæ and of the Parthian Empire, of which Persia formed a portion, and which lasted till 226 A. D. The supremacy was then recovered by Persia in the person of Ardishír Babigán (Artaxerxes), who obtained the sovereignty of all Central Asia, and left it to his descendants, the Sassanidæ, so-called from Sassan, the grandfather of Ardishír. This dynasty continued to reign for about 417 years, under twenty-six sovereigns. The reign of Sapor II, called the Great (310–381), and that of Chosroes I (Khosru, 531–579), were perhaps the most notable of the whole dynasty. The latter extended the Persian Empire from the Mediterranean to the Indus, from the Jaxartes to Arabia and the confines of Egypt. He waged successful wars with the Indians, Turks, Romans, and Arabs. Chosroes II 591–628) made extensive conquests, but lost them again in the middle of the reign of the Byzantine Emperor Heraclius. His son Ardishír (Artaxerxes) III, but seven years old, succeeded him, but was murdered a few days after his accession. He was the last descendant of the Sassanidæ in the male line. Numerous revolutions now followed, until Yezdigerd III, a nephew of Chosroes II, ascended the throne in 632 at the age of sixteen. He was attacked and defeated by Caliph Omar in 636–645, and Persia became for more than 150 years a province of the Mohammedan Empire. The Arab conquest had a profound influence on Persian life as well as on the language and religion. The old Persian religion was given up in favor of Mohammedanism, only the Guebres (which see) remaining true to the faith of their fathers. About the beginning of the ninth century the Persian territories began to be broken up into numerous petty states. The Seljuks, a Turkish dynasty, who first became powerful about 1037, extended their dominions over several Persian provinces, and Malek-Shah, the most powerful of them, conquered also Georgia, Syria, and Asia Minor. Through Genghis Khan the Tartars and Mongols became dominant in Persia about 1220, and they preserved this ascendency till the beginning of the fifteenth century. Then appeared (1387) Timurlenk (Tamerlane) at the head of a new horde of Mongols, who conquered Persia and filled the world from Hindustan to the extremities of Asia Minor with terror. But the death of this famous conqueror in 1405 was followed not long after by the downfall of the Mongol dominion in Persia, where the Turkomans thenceforward remained masters for 100 years. The Turkomans were succeeded by the Sufi dynasty (1501–1736). The first sovereign of this dynasty, Ismail Sufi, pretended to be descended from Ali, the son-in-law of Mohammed. He assumed the title of shah, and introduced the sect of Ali (the Shiite or Shiah sect). The great Shah Abbas (1587–1628) introduced absolute power, and made Ispahan

his capital. Under Shah Soliman (1666–94) the empire declined, and entirely sunk under his son Hussein. A period of revolts and anarchy followed until Kuli Khan ascended the throne, in 1736, as Nadir Shah, and restored Persia to her former importance by successful wars and a strong government. In 1747 Nadir was murdered by the commanders of his guards, and his death threw the empire again into confusion. Kerim Khan, who had served under Nadir, succeeded, after a long period of anarchy, in making himself master of the whole of Western Iran or modern Persia. He died in 1779. New disturbances arose after his death, and continued until a eunuch, Aga Mohammed, a Turkoman belonging to the noblest family of the tribe of the Kajars, and a man of uncommon qualities, seated himself on the throne, which he left to his nephew Baba Khan. The latter began to reign in 1796 under the name of Futteh Ali Shah, and fixed his residence at Teheran. This monarch's reign was in great part taken up with disastrous wars with Russia and Turkey. In 1813 he was compelled to cede to Russia all his possessions to the north of Armenia, and in 1828 his share of Armenia. Futteh Ali died in 1834, leaving the crown to his grandson, Mehemet Shah, during whose reign Persia became constantly weaker, and Russian influence in the country constantly greater. He died in 1848, and was succeeded by his son Nasr-ed-Deen, born 1829. The latter was obliged to suppress a number of insurrections, and in 1851 a serious rebellion of the pure Persian party in Khorassan, who refused obedience to the Kajar dynasty on religious grounds. Nasr-ed-Deen was assassinated in 1896, and his son, Mazaffer-ed-Deen, succeeded to the throne. The new Shah was a man of liberal ideas, who had made several visits to the European capitals, and who, in 1905, surprised the world by granting a legislative assembly and a constitution to his people. He died in January, 1907, and was succeeded by his son, Mohammed Ali Mirza. The new Shah rebelled against constitutional restrictions and in 1908 dispersed the assembly, an act that was followed by a revolution, the capture of the capital, February 13, 1909, and the dethronement of the Shah. His son, Ahmed Mirza, 11 years of age, was raised to the throne under a liberal regent. Russia, however, favored the cause of the deposed Shah and during the years 1911-12 seriously threatened the freedom of Persia. See *Shuster*.

Up till the beginning of the European war in 1914 Persia had come within the 'spheres of influence' of Russia and Great Britain, Russia controlling a section in the northern part, Great Britain a section in the south, leaving a central belt controlled by neither government. The country was invaded by Russian forces during the war, and upon their retirement a new Nationalist ministry was formed, with a new program looking to the rehabilitation of Persia. In 1919 Great Britain agreed to advance $10,000,000 to enable Persia to initiate certain contemplated reforms, with the help of a British financial adviser. Persian customs receipts were made the security for the loan.

Language and Literature.— Iranian is the name now usually given to all forms of the Persian language, which belongs to the great Indo-European or Aryan division of languages. The oldest form of the language is called Old Bactrian or Zend. It is that in which the Zend-Avesta (which see) was originally composed, and is very closely allied to the Old Sanskrit of the Vedas. The next development of the Iranian language is the Old Persian of the cuneiform inscriptions of the Achæmenian dynasty. We then lose sight of the Iranian language, and in the inscriptions and coins of the Sassanian kings, and in the translations of the Zenda-Vesta made during the period of their sway in Persia, we find a language called Pehlevi or Pehlvi, which is strictly merely a mode of writing Persian in which the words are partly represented by their Semitic equivalents. This curious disguised language is also known as *Middle Persian*. *New Persian* was the next development, and is represented in its oldest form in the *Shanameh* of Firdusi (about 1000 A. D.). In its later form it is largely mingled with Arab words and phrases, introduced with Mohammedanism after the Arab conquest. The written character is the Arabic, but with four additional letters with three points. The Persians possess rich literary treasures in poetry, history, and geography, but principally in the former. Among the most brilliant of Persian poets are: Rudagi, a lyric and didactic poet (flourished about 952), regarded as the father of modern Persian poetry; the epic poet Firdusi (beginning of 11th century), whose most celebrated work is the poetical history of the *Shanameh* ('Book of Kings') in 6000 coupiets; Omar Khayyam (died 1123), the author of the celebrated *Quatrains;* Nisâmi (12th century), a didactic poet; Sadi (13th century), a lyric and moral poet, author of the *Gulistan* or *Rose Garden*, a collection of stories; Rumi, his con-

temporary, a great mystic and didactic writer, etc.; Hafiz (born about the beginning of the 14th century), the most celebrated writer of odes; Jami (15th century), one of the most productive and most captivating of Persian poets. (See the different articles.) In the 16th century literary production almost ceased. The Persians are remarkable as being the only Mohammedan nation which has cultivated the drama. Their productions in this province of literature closely resemble the mysteries of the middle ages, and abound in natural and affecting lyrical passages. Not less numerous are the prose fables, tales, and narratives, many of which have been translated into English, French, German, and other European languages. It was also through the Persian that much of the Indian literature in fables and tales was transmitted to the Arabs, and thence to Europe. In the departments of history, geography, and statistics the Persians have some large and valuable works. Tabari is the earliest historian (died 922 A. D.). Mirkhond, who flourished in the 15th century, wrote a voluminous work on the *History of Persia* down to 1471. Geometry and astronomy were also cultivated with ardor by the Persians, but their knowledge on these subjects was in a great measure borrowed from the Arabians. Religious works are also numerous; besides those treating of Mohammed and Mohammedan religion, they have translations of the Pentateuch and the Gospels. The Persians have also translated many works belonging to old Indian literature, among others the epics *Ramayana* and *Mahabharata*, besides the abridgment of the *Vedas*. They have also paid great attention to their own language, as the number of lexicographical and grammatical works testify. Among the most important modern works are the journals of Nasiru 'ddin Shah, composed in colloquial Persian, and the writings of the religious leaders.

Persian Gulf, a gulf separating Persia from Arabia, and communicating with the Indian Ocean by the Strait of Ormuz, 35 miles wide; greatest length, 560 miles; medium breadth, 180 miles. It receives the waters of the united Euphrates and Tigris, and of a number of small streams; the principal port is Bushire. There are many islands in the gulf; the largest are: Kishim, Ormuz, and the Bahrein Isles; in the neighborhood of the latter there are lucrative pearl-fisheries.

Persian Powder, an efficacious insecticide introduced from the East, and prepared from the flowers of the *Pyrethrum carneum* or *roseum* (feverfew genus), nat. order Compositæ, a native of the Caucasus, Persia, etc.

Persian Wheel, or NORIA, the *Puisaro* of the south of France, a machine for raising water to irrigate gardens, meadows, etc., employed from time immemorial in Asia and Africa, and introduced by the Saracens into Spain and other European countries. It consists of a double water-wheel, with float-boards on one side and a series of buckets on the other, which are movable about an axis above their center of gravity. The wheel is placed in a stream, the water turns it, and the filled buckets ascend; when they reach the highest point, their lower ends strike against a fixed obstacle, and the water is discharged into a reservoir. In Portugal, Spain, Southern France, and Italy, this contrivance is extensively used; and has been modified to enable it to draw water also from ponds and wells, animals supplying the motive power, and pots, leather, or other bags taking the place of buckets.

Persigny (per-sēn-yē), JEAN GILBERT VICTOR FIALIN, DUC DE, a French statesman, born in 1808; died in 1872. In youth a royalist, in the army a republican, he finally became one of the staunchest and most active supporters of Napoleon III. He instigated and took part in the military rising at Strasburg in 1836, and was arrested, but escaped. In 1840 he shared Napoleon's expedition to Boulogne, was again captured, and for a time kept in confinement. On the outbreak of the revolution of February, 1848, he hastened to Paris, contributed largely to determine the vote by which Napoleon was elected president (December 10, 1849), and was also one of the most prominent actors in the *coup d'état* (December 2, 1851), by which Napoleon made himself emperor. He held the office of minister of the interior from 1852–54, and again from 1860–63; was appointed member of the senate in 1852; ambassador to Great Britain in 1855. He was elevated to the rank of duke in 1863.

Persimmon (pėr-sim'un), the fruit of the *Diospyros virginiana*, a tree (a species of ebony) native to the United States, more especially the Southern States, where it attains the height of 60 feet or more. The fruit is succulent, reddish, and about the size of a small plum, containing a few oval stones. It is powerfully astringent when green, but when fully ripe the pulp becomes soft, palatable, and very sweet. There are species also in Africa and

Europe, and a Japanese species, the fruit of which is larger than that of the American persimmon.

Persius (per'she-us), full name AULUS PERSIUS FLACCUS, a Roman satirical poet, was born A. D. 34 at Volterra in Etruria, and died in 62. He was well connected; was on friendly terms with some of the most eminent men of the time, and much beloved for the purity and amenity of his manners. Six satires by him have been preserved; they are distinguished for vigor, conciseness, and austerity of tone. Dryden and Gifford, among others, have translated them into English.

Personality, DOUBLE OR MULTIPLE, a name given to cases of alternating consciousness, in which a person may lose all memory of past events and gain a new series of memories. In such cases these two series of memories may alternate or replace each other, so that two distinct personalities seem to occupy one body. This abnormal state is usually the result of some injury affecting the brain. In some cases more than two personalities are developed. In normal persons the dream state is a parallel example, the dream series of thoughts disappearing on waking and at times reappearing on renewal of sleep.

Personalty, or PERSONAL PROPERTY, movables; chattels; things belonging to the person, as money, jewels, furniture, etc., as distinguished from *real* estate in lands and houses. In the United States and England the distinction between *real* and *personal* property is very nearly the same as the distinction between *heritable* and *movable* property in the law of Scotland.

Personation. See *False Personation.*

Personification (pêr-son-i-fi-kā'-shun), in the fine arts, poetry, and rhetoric, the representation of an inanimate subject as a person. This may be done in poetry and rhetoric either by giving epithets to inanimate subjects which properly belong only to persons, or by representing them as actually performing the part of animated beings.

Perspective (pêr-spek'tiv), the art or science which teaches how to produce the representation of objects on a flat surface so as to affect the eye in the same manner as the object or objects themselves when viewed from a given point. Perspective is intimately connected with the arts of design, and is particularly necessary in the art of painting, as without correctness of perspective no picture can be entirely satisfactory. Perspective alone enables us to represent foreshortenings (see *Foreshortening*) with accuracy, and it is requisite in delineating even the simplest positions of objects. That part of perspective which relates to the form of the objects differs essentially from that which teaches the gradation of colors according to the relative distance of objects. Hence perspective is divided into *mathematical* or *linear perspective*, and the perspective of color or *aerial perspective*. The contour of an object drawn upon paper or canvas represents nothing more than such an intersection of the rays of light sent from the extremities of it to the eye, as would arise on a glass put in the place of the paper or canvas. Suppose a spectator to be looking through a glass window at a prospect without, he will perceive the shape, size, and situation of every object visible upon the glass. If the objects are near the window the spaces they occupy on the glass will be larger than those occupied by similar objects at a greater distance; if they are parallel to the window, their shapes upon the glass will be parallel likewise; if they are oblique, their shapes will be oblique; and so on. As the person alters his position, the situation of the objects upon the window will be altered also. The horizontal line, or line corresponding with the horizon, will in every situation of the eye be upon a level with it, that is, will seem to be raised as far above the ground upon which the spectator stands as his eye is. Now suppose the person at the window, keeping his head steady, draws the figure of an object seen through it upon the glass with a pencil, as if the point of a pencil touched the object, he would then have a true representation of the object in perspective as it appears to his eye. Representations of objects have, however, generally to be drawn on opaque planes, and for this purpose rules must be deduced from optics and geometry, and the application of these rules constitutes what is properly called the art of perspective. Linear perspective includes the various kinds of *projections*. *Scenographic* projection represents objects as they actually appear to the eye at limited distances. *Orthographic* projections represent objects as they would appear to the eye at an infinite distance, the rays which proceed from them being parallel instead of converging. It is the method on which plans and sections are drawn. A *bird's-eye view* is a scenographic or orthographic projection taken from an elevated point in the air from which the eye is supposed to look down

upon the objects. *Aerial perspective* teaches how to judge of the degree of light which objects reflect in proportion to their distance, and of the gradation of their tints in proportion to the intervening air. By its application each object in a picture receives that degree of color and light which belongs to its distance from the spectator. The charm and harmony of a picture, particularly of a landscape, depend greatly upon correct aerial perspective.

Perspiration (pėr-spi-rā'shun), or SWEAT, the fluid secretion of special glands, the *sudoriparous* or *sweat glands* of the skin. The term perspiration is, however, sometimes used to include all the secretions of the skin, such as those of the sebaceous glands or follicles, etc. The sweat-glands, situated in the subcutaneous adipose or fat tissue of the skin, consist of a coiled-up tube, invested by a capillary network of blood-vessels, and continued to the surface of the skin, where it opens in an oblique valvular aperture. The openings of the sweat-ducts constitute the popular 'pores' of the skin. The largest and most numerous ducts are situated in the palm of the hand (Krause estimates 2736 to the square inch, Erasmus Wilson 3528). Perspiration is divided into *insensible* and *sensible*, the former being separated in the form of an invisible vapor, the latter so as to become visible by condensation in the form of little drops adhering to the skin. Water, fatty acids, carbonic acid, salts, etc., are removed from the body by the sweat, by which also the skin is kept moist. By the passing off of the sweat as vapor, heat is lost from the body, and thus the greater or less activity of the sweat glands plays an important part in regulating the bodily temperature. For these reasons the regular process of perspiration is necessary for the preservation of good health. The constituents of sweat are to some extent dependent on the various bodily conditions and circumstances, hence the various results of analysis by different authorities. The quantity of sweat evolved from the skin has been estimated at nearly two pounds daily.

Perth (perth), a city of Scotland, capital of the county of the same name, on the right bank of the Tay. The North and South Inches, two fine public parks, extend along the river bank, and a bridge of nine arches leads to the suburb of Bridgend. St. John's Church, a Gothic building partly ancient, the Episcopal cathedral, the County Buildings, the municipal buildings, and the railway-station, the largest in Scotland, deserve special mention. Perth is celebrated for its bleachfields and dyeworks. It manufactures cotton goods, ginghams, winceys, plaids, table-linen, carriages, castings, etc. The river is navigable to the city for small vessels.—Perth is generally supposed to be of Roman origin. Its earliest known charter is dated 1106; but it was first erected into a royal burgh in 1210 by William the Lion. Till the death of James I, in 1437, it was the capital of Scotland, and both then and subsequently it became the scene of some of the most remarkable events in Scottish history. Pop. 33,566.—The COUNTY, which occupies the center of Scotland, has an extreme length, east to west, of 63 miles; breadth, north to south, 60 miles; area, 12,528 sq. miles. The Grampians, which occupy the N. and N.W. of the county, culminate in several high peaks, including Benlawers (3984 feet), and the Ochil and Sidlaw ranges occupy the S.E. The principal river is the Tay, the basin of which comprises nearly the whole county. The chief lakes are Loch Tay, a magnificent expanse of water, 16 miles long; Loch Ericht, Loch Rannoch, and Loch Katrine. Sheep farming is extensively carried on. The salmon fisheries of the Tay are very valuable. The principal towns of the county are Perth, Blairgowrie, Crieff, and Dunblane. Pop. 123,260.

Perth, capital of Western Australia, on the Swan River, 12 miles above its port, Freemantle (at the mouth of the Swan River). It was founded with the Swan River Settlement in 1829, is well laid out, with broad streets, and has some good buildings. Pop. 55,000.

Perth Amboy, a city and port of Middlesex Co., New Jersey, on Raritan River, Staten Island Sound, Raritan Bay 21 miles S. W. of New York; has a good harbor. Here are large deposits of fire-clay and kaolin, and fire bricks, tiles and terra cotta of the best quality are made. It has other industries of importance, including smelting, refining and chemical works, iron foundries, steel works, etc. **Pop. (1910)** 32,121; (1920) 41,707.

Perthes (per'tās), FRIEDERICH CHRISTOPH, a German publisher, born in 1772; died in 1843. After carrying on business in Hamburg for a number of years, in 1821 he removed to Gotha and founded a prosperous publishing business, chiefly of historical and theological literature. An uncle founded the firm Justus Perthes of Gotha, publishers of the famous geographical work *Petermanns Mitteilungen*, and of the *Almanach de Gotha.*

Pertinax (pėr'ti-naks), PUBLIUS HELVIUS, a Roman emperor, born in 126 A. D., the son of a freedman. He distinguished himself in the army, and attracted the attention of Marcus Aurelius, who elevated him to the consulate in 179. During the reign of Commodus, Pertinax was employed in Britain and Africa, and finally made prefect of Rome. After the murder of Commodus he was proclaimed emperor in 193, but in three months was murdered by the prætorian guards.

Perturbations (pėr-tur-bā'shunz), the orbital irregularities or deviations of the planets from their regular elliptic orbits. These deviations arise, in the case of the primary planets, from the mutual gravitations of these planets towards each other, which derange their elliptic motions around the sun; and in that of the secondaries, partly from the mutual gravitation of the secondaries of the same system, similarly deranging their elliptic motions around their primary, and partly from the unequal attraction of the sun on them and on their primary.

Peru (pe'rō), a city of Lasalle Co., Illinois, on Illinois River at head of navigation, and on Illinois and Michigan Canal. It has foundry, machine shops, zinc works, clock works, planing mill, coal mines, etc. Pop. 8869.

Peru, a city, county seat of Miami Co., Indiana, on Wabash River and 3 trunk line railroads, 75 miles N. of Indianapolis. It has large railroad shops, canning factory and manufactures of gas engines, automobiles, trucks and tractors, kitchen cabinets, chairs, etc. Pop. (1910) 10,910; (1920) 12,410.

Peru (pe-rō'), a republic of South America, bounded on the north by Ecuador, on the west by the Pacific Ocean, on the south by Chile, and on the east by Bolivia and Brazil; area, 695,733 sq. miles; pop. estimated at 4,500,000. Principal towns: Lima, the capital; Arequipa; Callao, the principal port; and Cuzco, the ancient seat of the Inca empire. The population is mixed, including whites, Indians, Africans, Asiatics, and their mixtures and sub-mixtures. The dominant race is of Spanish origin, to a large extent mixed with Indian blood. The Indians are chiefly descendants of tribes organized under the Incas.

Physical Features.—This country exhibits great varieties of physical character. It is traversed throughout its length by the Andes, running parallel to and on an average 60 miles distant from the coast, the region between largely consisting of sandy desert, except where watered by transverse mountain streams. The Andes consist here of two main chains or Cordilleras, connected by cross ranges, inclosing extensive and lofty valleys and plateaus. The Andes region is roughly estimated at about two-fifths of the entire area of Peru. The loftiest summits are in the southern portion of the W. Cordillera; several peaks attain there an altitude of 20,000 feet or more. The country east of the Cordilleras, forming a part of the Amazon basin, and mostly covered by dense forest, is but little known and almost exclusively in possession of the native Indians. It is called Montaña or Los Bosques. The elevated region between the gigantic ridges of the E. and W. Cordilleras, called Las Sierras, is now the chief, as it was anciently almost the exclusive seat, of the population of Peru. It is partly occupied by mountains and naked rocks, partly by table-lands yielding short grass, and extensive hilly pasture grounds, and partly by large and fertile valleys. The most important districts are those of Pasco, of Cuzco, the valleys of the Rio Jauja, and of the Marañon or Amazon. The first of these lies at one of those points where the branches of the Andes unite, the ridges sinking into an elevated plain, which has here a general height of 14,000 feet. The veins of the precious metals, with which this region abounds, have attracted to it a comparatively dense population. The table-land of Cuzco descends from an elevation of less than 12,000 feet in the S. to about 8000 feet in the N. Of the lakes Lake Titicaca (12,542 feet above sea-level), the largest in South America, and which partly belongs to Bolivia, is the only one of commercial importance. The chief rivers are the Marañon or main stream of the Amazon, and the Huallaga and Ucayale, which join the Marañon; the Ucayale, formed by the united waters of a number of streams (Apurimac, Urubamba, Paucartambo), being about the same size as that river. In the maritime region of Peru earthquake shocks are of common occurrence, and some of them have been of exceptional severity, the most disastrous being those of 1746, 1868, and 1877. Gold and silver occur in all the provinces of Peru, and form the chief wealth of the country. Quicksilver is also abundant. Copper, lead, and iron also exist in various places.

Climate.—The climate of Peru is as varied as its physical aspect. On a portion of the coast no rain has fallen within the memory of man, but the *garua*, a thick heavy mist often accompanied by drizzling rain, is a partial

compensation, and the rivers from the Andes afford means of irrigation for sugar and cotton plantations. From November to April the sky is cloudless, and were it not for the cool oceanic currents, and the streams of cold air from the snowy Andes, the heat would be unbearable. Fortunately the rainy season in the mountains corresponds with this period. The central plateau region has a mild and comparatively humid climate, but the higher regions are inclement and subject to terrific tempests. East of the Andes the regular equatorial winds from the east come loaded with humidity, and, checked by the mountains, pour down copious, and in some places almost perpetual, rains.

Plants and Animals.— Peru is exceedingly rich in botany, each region having its own flora. In the less elevated portions of the Eastern Andes a tropical vegetation is found; while on the higher parts representatives of Alpine families (as the gentians) luxuriate. In the forests of Eastern Peru cinchona trees grow abundantly and supply the valuable bark from which the quinine is extracted. The same zone, especially the hot plains and swamps, also supply coca, the medicinal properties of which have for centuries been known to the natives of Peru and Bolivia, who chew the leaves as a stimulant. Tobacco, cotton, sugar, rice, coffee, coca, and maize are grown in various parts and in increasing quantities. The eastern face of the Andes is as remarkable for its fauna as it is for its flora. The forests on the lower ranges and in the plains swarm with many species of parrots and monkeys; the tapir, sloth, ant-eater, armadillo, etc., are found here; the rivers are alive with alligators; and in the inundated plains the boa-constrictor attains a huge size. The puma and the South American bear inhabit the higher levels; the llama, the guanaco, the alpaca, and the vicuña, the still more elevated regions.

Commerce.— Peru exports precious metals, silver ores, guano, cubic nitre, wool of the llama, alpaca, and vicuña, cotton, sugar, cinchona bark, coca leaves and cocaine, chinchilla skins, and hides. The chief imports are machinery, cotton, woolen, and linen goods, and provisions. The trade of the country has suffered much from revolutions, and more from the disastrous war with Chile (1879–83). The export of guano and cubic nitre has naturally declined since the Chileans possessed themselves of the guano deposits of the Lobos Islands, and of the province of Tarapacá, which contains the richest nitrate beds. The foreign trade is chiefly carried on with Great Britain and Germany. The internal trade of the country has been fostered by the construction of railways, one of which attains a height of 15,600 feet in its passage through the Andes, and exhibits remarkable engineering works. Some 2000 miles have been constructed at a cost of about $170,000,000, but only about 1500 miles are in working order.

Government, etc.— The government is based on a constitution adopted in 1867, and modeled on that of the United States. The legislative power is in the hands of a senate and a house of representatives, the senate being composed of two senators for each province, and the house of representatives containing one member for every 20,000 of the population. The president, elected for four years, is the executive. Peru has a foreign debt (chiefly contracted in England) amounting to $157,000,000, including unpaid interest since 1876. In 1890 this debt was settled by transfer of all the railways of the State to the bondholders. There is besides an internal debt of $35,000,000. The annual revenue amounts to about $15,000,000. In Peru the Indian is on a level in political rights with the white man; there exists absolute political but not religious freedom, the constitution prohibiting the exercise of any other religion than the Roman Catholic. There is, however, a considerable amount of tolerance. Education is compulsory and free; there are universities at Lima, Arequipa, and Cuzco. The Peruvian language, of which there are many dialects, still maintains itself alongside of the language of the conquerors.

History.— Of the early history of Peru we are almost entirely ignorant, but existing ruins, spoils secured by the Spaniards, and the description left us by the historians of the Spanish conquest, sufficiently prove that the ancient Peruvians had no mean knowledge of architecture, sculpture, metal work, etc. They also had made considerable progress in astronomical science. The early religion of the Peruvians is bound up in the god Viracocha, the creator of the sun and the stars, and from him the Incas or emperors claimed descent as the sons of the sun. Under the Incas the empire was divided into four parts, corresponding to the four cardinal points; each division had a separate government, presided over by a viceroy of royal blood. All the land belonged to the Inca, and trade was carried on by barter, money being unknown. The thirteenth monarch of the Incas was reigning when the Spanish adventurer, Pizarro, disembarked

in Peru in 1531. The Inca was taken prisoner (1532), numbers of his subjects were massacred, and the whole country fell in a short time into the hands of the invaders. It was then formed into a Spanish viceroyalty; subsequently parts of it were made into separate provinces such as Quito and Buenos Ayres. In 1821 the country proclaimed its independence, but did not obtain actual freedom from Spanish rule until 1824, after a prolonged war. Since then Peru, like the rest of the South American republics, has suffered from much dissensions and revolutions. In the spring of 1879 it joined Bolivia in a war against Chile, resulting in complete defeat. Peru had to cede by the peace of 1883 the province of Tarapacá, while Chile also got possession of the departments of Tacna and Arica for ten years, when the inhabitants were to decide by vote whether they would remain under Chilean rule. No vote was taken, however, and settlement was deferred. In 1921 delegates from Peru and Chile met at Washington, D. C., to discuss the question. Peru severed diplomatic relations with Germany on Oct. 6, 1917, during the European war. Señor Leguia assumed the presidency of the republic July 4, 1919, by a *coup d'état;* legalized later by Congress, the president taking the oath on October 15, 1919, for the term 1919-24.

Peru Balsam, a resinous product obtained from trees of the genus *Myroxylon* or *Toluifera*, family *Leguminosæ*, natives of tropical America, used in medicine and perfumery. It is obtained from the trunk of the tree after beating, scorching and removing the bark. Its volatile oil contains cinnamic and benzoic acid, which give it fragrance. It has the general qualities of balsams and is used chiefly as a disinfectant expectorant.

Perugia (pā-rō'jä; ancient *Perusia*), a town of Central Italy, capital of the province of the same name, 84 miles north of Rome. It is rich in art and literary treasures, and has many remarkable buildings, including a Gothic cathedral of the 15th century, a number of churches and monasteries, a town-hall (Italian-Gothic, begun 1281), and a university, founded in 1307. The manufactures, not of much consequence, consist of velvet, silk stuffs, etc. Perugia was an old Etruscan city, and was conquered by Rome in 310 B.C. Subsequently it was taken by Totila, and recaptured by Narses in 552. It was incorporated with the Papal States in 1512 and annexed to Italy in 1860. In the 15th century it became the center of the Umbrian school of painting. Pop. 70,227.—The province of Perugia has an area of 3770 square miles, and is very fertile. It is traversed in all directions by offsets of the Apenines. The principal stream is the Tiber. Pop. 714,682.

Perugia, Lago di, a lake in Italy, 9 miles west of Perugia, about 10 miles long, varying in breadth from 7 miles to 4 miles, surrounded with olive plantations. It contains three islands, and abounds in fish.

Perugino (per-ụ-jē'nō), Pietro Vanucci, surnamed *Il Perugino*, the founder of the Roman school of painting, born at Città della Pieve (a dependency of Perugia) in 1446; died at Fontignano in 1523. He spent his youth, learned his art, and lived much at Perugia (whence his surname), and at an early age distinguished himself by his works. His easel pictures were done in his earlier practice in tempera, but he afterwards became a master in the oil method. About 1480 Pope Sixtus IV sent for him to Rome, where he was employed along with Signorelli, Ghirlandaio, Botticelli, and Rosselli in decorating the Sistine Chapel with frescoes. Fine specimens of his frescoes are preserved in Perugia, Rome, Bologna, and Florence, and specimens of his other works are not infrequent in European galleries. Raphael is his most celebrated disciple.

Peruke. See *Wig.*

Peruvian Bark. See *Bark, Peruvian.*

Peruzzi (pā-ṛụt'sē), Baldassare, architect and painter of the Roman school, born at Siena in 1481; died at Rome in 1536. He went early to Rome and was employed in the decoration of various churches. He designed the Farnesina Villa on the banks of the Tiber, and he succeeded Raphael as architect of St. Peter's. After the sack of Rome by the army of Constable Bourbon he returned to Siena, where he was made city architect. In 1532 he was again in Rome, and thenceforward devoted himself entirely to architecture. His best existing works in fresco are at Siena.

Pesaro (pā'zä-rō; ancient, *Pisaurum*), a fortified seaport of Italy, at the mouth of the Foglia, in the Adriatic. It is the see of a bishop. The harbor, formed by the mouth of the Foglia, has become shallow; but the trade in wine, fruit (particularly figs), oil, silk, etc., is considerable. The composer Rossini was born here in 1792. Pop. 28,483.

Peschiera (pes-ki-ā′rȧ), a town and fortress of Italy, 20 miles northwest of Mantua, one of the four strongholds which form the famous 'Quadrilateral.' Pop. 2962.

Peseta (pe-sā′ta), the Spanish money unit, equivalent to a franc.

Peshawar (pā-shä′wur), a town of India, in the Punjab, capital of the division of the same name, 12 miles east of the eastern extremity of the Khyber Pass. It covers a large area, is surrounded by a mud wall, and commanded by the Bala Hissar, a fort which crowns an eminence just outside the walls. It has several good mosques, but few architectural attractions. It is favorably situated for commerce, lying in the great route from Bokhara and Cabul to India, and its proximity to the Khyber Pass makes it an important strategical point of British India, hence a British garrison is stationed here. The population, including the military cantonment 2 miles W. of the city proper, is 95,147. The cantonment accommodates a large force, the population in it being about 20,000. The division or commissionership comprises the districts of Peshawar, Hazara, and Kohat, with the control of part of the hill tribes inhabiting the Khyber Pass. Area, 8381 square miles.

Peshito (pe-shē′tō), or PESHITTO (that is, 'simple,' 'true,' or according to some, 'explained'), is the name given to a Syriac translation of the Old and New Testaments. Neither the time of its appearance nor its authorship are positively known. It is extremely faithful, and possesses high authority, especially in regard to the New Testament, of which it is probably the first translation that was made. Four of the catholic epistles and the Revelation of St. John are wanting.

Peso (pā′sō), a silver coin and money of account which is used in Mexico and other parts of Spanish America. It is often considered equivalent to a dollar.

Pessimism (pes′i-mizm), a modern term to denote the opinion or doctrine that maintains the most unfavorable view of everything in nature, and that the present state of things only tends to evil; that in human existence there is an enormous surplus of pain over pleasure, and that humanity can find real good only by abnegation and self-sacrifice. It is antithetical to *optimism*, and as a speculative theory is the work of Schopenhauer and Von Hartmann, though it is preluded in the metaphysics of Brahmanism and the philosophy of Buddhism.

Pestalozzi (pes-ta-lot′sē), JOHANN HEINRICH (1746-1827), a Swiss philanthropist and educational reformer. After a few years of successful teaching in various places he opened a school in the Castle of Yverdun (canton Vaud), which the government had placed at his disposal. His novel *Lienhardt and Gertrud* (1781-89, 4 vols.) exerted a powerful moral influence, while his educational treatises have laid the foundation for the more rational system of elementary instruction which now obtains in Europe. The grand principle that lay at the basis of Pestalozzi's method was that of communicating all instruction by direct appeal to the senses and the understanding, and forming the child by constantly calling all his powers into exercise.

Pesth, or PEST. See *Budapest.*

Pestilence. See *Plague.*

Petain (pe-tan′), HENRI PHILIPPE, French soldier, born near Calais in 1856. He graduated from the St. Cyr military school and in 1890 became captain of the Chasseurs à Pied. He was made a general of a division in September, 1914, and soon after the opening of the great war he commanded the 23d Army Corps, taking a brilliant part in the Allied offensive in Artois in May and June, 1915. His greatest fame is based upon his heroic defense of Verdun, February to June, 1916, from the repeated assaults of the German armies. He succeeded General Nivelle as chief of staff.

Petal (pet′al), an appellation given to the leaves of the corolla of plants, in distinction from those of the calyx, called *sepals.*

Petalite (pet′a-līt), a rare mineral, a silicate of aluminum and lithium, containing from 5 to 6 per cent of the latter. It occurs in masses of foliated structure; color white, occasionally tinged with red, green, or blue.

Petaluma (pet-a-lö′ma), a city of Sonoma Co., California, 36 miles N. of San Francisco; the world's largest poultry center; also has dairy and manufacturing interests. Pop. 6226.

Petard (pē-tard′), a bell-shaped machine of gun-metal, and loaded with from 9 to 20 lbs. of powder. It was formerly employed to break down gates, bridges, barriers, etc., by its explosion.

Petaurus. See *Flying-phalanger.*

Petchora (pet-chō′ra), a river of Russia, rises in the north of the government of Perm, on the western slope of the Ural Mountains, and

after a course of about 900 miles falls into a bay of the Arctic Ocean by a number of mouths.

Petechiæ (pe-tek'i-ē), in medicine, a name for purple or crimson spots which appear on the skin in certain diseases.

Peter (pē'tėr), THE APOSTLE, commonly called Saint Peter, was a Galilean fisherman from Bethsaida, originally named Simon, the son of Jona, and brother of St. Andrew, who conducted him to Christ. Jesus greeted Simon with the significant words, 'Thou art Simon the son of Jona; thou shalt be called Cephas' (in Greek *Petros*, a stone, whence the name Peter). After the miraculous draught of fishes Peter became a regular and intimate disciple of our Lord. The impetuosity of his character led Peter, especially in the early days of his apostleship, to commit many faults which drew upon him the rebuke of his divine Master. His zeal and eloquence made him often the speaker in behalf of his fellow-apostles on important occasions, and his opinions had great influence in the Christian churches. On one memorable occasion he incurred the rebuke of the apostle Paul in consequence of his behavior towards the Gentile Christians in regard to social intercourse. Nothing certain is known of his subsequent life, but it is almost beyond doubt that he was a joint-founder of the church at Rome, and that he suffered martyrdom there, most likely under Nero, about 64 A. D. The only written documents left by Peter are his two *Epistles*. The genuineness of the *First Epistle* is placed beyond all reasonable doubt, both the external and internal evidence being of the strongest description; that of the *Second Epistle*, however, has been disputed by numerous critics on what appears to be plausible grounds. Doubts of its genuineness already existed in the time of Eusebius, and it was not admitted into the New Testament canon till 393 A. D.

Peter THE CRUEL, King of Castile and Leon, born 1334, succeeded his father Alfonso XI in 1350, and died in 1369. His reign was one long series of cruelties and despotic acts. The year following his coronation he put to death Eleanora de Guzman, his father's mistress. In 1353 he married, though contrary to his will, Blanche of Bourbon, one of the most accomplished princesses of the time, whom, however, he abandoned two days after his marriage in order to rejoin his mistress, Maria Padilla. The queen was imprisoned and divorced, and his mistress's relations appointed to the highest offices. He then married the beautiful Juana de Castro, but only to abandon her after a few months. Two revolts against him were unsuccessful. On the second occasion, however, in 1366, Peter fled, and was dethroned, but he was reinstated in 1367 by an English army led by Edward the Black Prince. Executions and confiscations naturally followed, but these fresh cruelties only helped to swell the ranks of his opponents, of whom the chief was his half-brother, Henry of Transtamara. In 1369 Henry gained a signal victory over Peter at Montiel, and the latter was slain in a sword combat with his brother.

Peter THE HERMIT, an enthusiastic monk of Amiens, whose preaching, after a pilgrimage to Jerusalem (end of the eleventh century), gave rise to the first Crusade. (See *Crusades*.) Peter led the way through Hungary at the head of an undisciplined multitude of nearly 100,000 men, a comparatively small number of whom survived to reach their destination, and distinguished himself by his personal courage at the storming of the holy city. On his return to his native country he founded the abbey of Noirmoutier, and died its first superior in 1115.

Peter I (THE GREAT), ALEXEIEVITCH, Emperor of Russia, born in 1672, was the eldest son by his second wife of the Czar Alexis Mikhailovitch. His elder brothers, Fedor and Ivan, were

Peter the Great.

feeble in constitution. Fedor succeeded his father in 1676, and died in 1682. Ivan renounced the crown, and Peter was declared czar, with his mother, the Czarina Natalia Kirilovna, as regent.

Sophia, third daughter of Alexis, ambitious to govern, succeeded in having Ivan proclaimed czar jointly with Peter, and herself regent. Peter was relegated to private life, his education purposely neglected, and his bad habits encouraged. In 1689 he wrested the power from his sister, and confined her in a convent. Peter was now virtually sole emperor, though, till the death of his brother in 1697, he associated his name with his own in the ukases of the empire. He now determined to do what he could to raise his country out of its barbarism, and to place its people in the ranks of civilized nations. His journey to Holland and England (1697–98), when he worked as an artisan in shipyards, is familiar; and the knowledge he there gained was amply profited by on his return. Peter, however, not only created a navy, but gave Russia a seaboard and seaports by wresting the Baltic provinces from Charles XII of Sweden. Young Russian nobles were obliged to travel; schools of navigation and mathematics were founded; agriculture was improved by the introduction of implements, seeds, and superior breeds of cattle. Peter imported foreign artisans of all kinds, established manufactories of arms, tools, and fabrics, and distributed metallurgists through the mining districts of Russia; roads and canals were made to foster internal commerce, and to extend trade with Asia. In 1703 he laid the foundation of St. Petersburg, and twenty years later of its Academy of Sciences. Laws and institutions which in any way interfered with his projects he either abolished or altered. In his zeal to do good he was too frequently injudicious in choosing times and seasons, and the least show of opposition irritated him into ferocity. He repudiated his wife a few years after marriage for her reactionary leanings; for the same reason his son Alexis was ill treated, compelled to renounce the succession, and condemned to death, but died suddenly before sentence could be carried out. Peter died January 28, 1725, the immediate cause being inflammation, contracted while assisting in the rescue of some soldiers in Lake Ladoga. In 1707 he had married his mistress Catharine; this marriage was publicly celebrated in 1712; Catharine was crowned in 1724, and succeeded Peter after his death. See *Catharine I.*

Peter II, ALEXEIEVITCH, Emperor of Russia, grandson of Peter the Great and son of Alexis, ascended the throne in consequence of the will of Catharine I, in 1727, when but thirteen years old. He died in 1730 of the smallpox, and was succeeded by Anna Ivanovna.

Peter III, FEODOROVITCH, Emperor of Russia, born in 1728, was the son of Anna Petrovna, daughter of Peter the Great, and the Duke of Holstein. Peter III ascended the throne in January, 1762, and was assassinated in July of the same year.

Peter I (1844-1921), King of Servia, now Jugo-Slavia, son of Alexander Kara-Georgevitch. He ascended the throne in 1903.

Peterborough (pē′ter-bur-o), an episcopal city and parliamentary borough of England, partly in Huntingdonshire, but chiefly in county Northampton, on the left bank of the Nen, 76 miles N. of London. It is an important railway and agricultural center. The principal building is its cathedral, originally founded in 655, destroyed by the Danes in 870; rebuilt in 966, and again partly destroyed by fire in 1116. It has its present form since the commencement of the sixteenth century. The prevailing character of the building is Norman, but it exhibits examples of the transition, early English, decorated English, and perpendicular styles. Some alterations and restorations have recently been carried out. The bishopric was founded by Henry VIII (1541), and his wife, Catharine of Aragon, was interred in this cathedral. Peterborough received a municipal charter in 1874. Pop. (1911) 33,578.

Peterborough, a flourishing town of Canada, province of Ontario, on the river Otonabee, 26 miles north of Lake Ontario. It is well built; has manufactures of machinery, agricultural implements, etc., and being a railway center has a good trade. Pop. (1911) 18,360.

Peterborough, CHARLES MORDAUNT, EARL OF, born about 1658, succeeded his father, Lord Mordaunt, 1675, and his uncle in the earldom of Peterborough, 1697. William of Orange created him Earl of Monmouth, and appointed him first commissioner of the treasury for his services in connection with the dethronement of James II. He eminently distinguished himself in Spain as a commander in the Spanish Succession war, 1705, especially by the capture of Barcelona, and received the thanks of the British parliament. He also held several diplomatic posts; was created a Knight of the Garter in 1713, general of the British marine forces in 1722, and died in 1735 on a voyage to Lisbon.

Peterhead (pē′tėr-hed), a seaport in Scotland, in the county and 26 miles N.N.E. of Aberdeen, on a peninsula, near the most easterly point of Scotland, with a harbor on either side of it, communicating by a cut across the isthmus. The town is substantially built of granite, obtained from quarries in the neighborhood, has several elegant public buildings, and a statue of Field-marshal James Keith, presented by William I, emperor of Germany. It has a good trade, and is an important center of the herring fishery. The Greenland whale and seal fisheries are also important industries. Pop. (1921) 16,144.

Peterhof (pē′tėr-hof), a town in Russia, 18 miles W.S.W. of Petrograd, celebrated for its imperial summer palace in Versailles style, built in 1711 by Peter the Great. Pop. 16,000.

Petermann (pā′tėr-mån), AUGUST, a German geographer, born in 1822; died at Gotha in 1878. His first important work in cartography was a map for Humboldt's *Central Asia.* He afterwards assisted Keith Johnston in the preparation of his *Physical Atlas;* became a member of the Royal Geographical Society, and made valuable studies in African geography, etc. In 1854 he became professor of geography at Gotha, and superintendent of Justus Perthes' geographical establishment, editing the *Mitteilungen,* the foremost among geographical magazines.

Peter-port, ST., capital of the island of Guernsey, on a bay on the east side, picturesquely situated on the slope of a hill. It has a court-house and prison, a college, and the finest church in the Channel Isles. The environs are exceedingly beautiful. The harbor is large and commodious, and the roadstead affords convenient anchorage. Fort-George, a regular fortification of considerable strength, stands about a half mile south from the town. Pop. about 18,000.

Peter's, SAINT, the Cathedral of Rome, the largest and one of the most magnificent churches in Christendom. It is a cruciform building in the Italian style, surmounted by a lofty dome, built on the legendary site of St. Peter's martyrdom. In 306 Constantine the Great erected on this spot a basilica of great magnificence. In the time of Nicholas V it threatened to fall into ruins, and he determined on its reconstruction, but the work of restoration proceeded slowly, and Julius II (1503-13) decided on the erection of an entirely new building. He laid the foundation-stone of the new cathedral on the 18th of April, 1506, and selected the famous Bramante as his architect. After the latter's death various architects had charge of the work until Michael Angelo was appointed in 1546. He nearly completed the dome and a large portion of the building before his decease (1563). The nave was finished in 1612, the façade and portico in 1614, and the church was dedicated by Urban VIII on November 18, 1626. The extensive colonnade which surrounds the piazza and forms a magnificent approach to the church was begun by Bernini in 1667. The interior diameter of the dome is 139 feet, the exterior diameter 195½ feet; its height from the pavement to the base of the lantern 405 feet, to the top of the cross outside 448 feet. The length of the cathedral within the walls is 613½ feet; the height of the nave near the door 152½ feet; the width 87½ feet. The width of the side aisles is 33¾ feet; the entire width of nave and side isles, including the piers that separate them, 197¾ feet. The height of the baldacchino is 94½ feet. The circumference of the piers which support the dome is 253 feet.

Peters, RICHARD, American jurist, born near Philadelphia, August 22, 1744. During the Revolutionary War he was made secretary of the board of war in 1776, serving until 1781. Died August 22, 1828.

Petersburg (pē′terz-burg), a city and river port of Virginia, on the Appomattox River, 23 miles S. of Richmond. It is an important railway center, and a place of considerable trade and manufacturing industry. The falls of the river, just above the city, furnish abundant power to the various mills and factories. This place was besieged by the Federal forces under General Grant in 1864-65, and the capture of this town, 'the last citadel of the Confederacy,' was soon followed by the surrender of General Lee. Pop. (1910) 24,127; (1920), 31,002.

Petersen, NIELS MATTHIAS, Danish historian and philologist, born Oct. 24, 1791; died May 11, 1862. Among other works he wrote a *History of the Danish, Norwegian and Swedish Languages* (1829-30).

Peter's Pence, a papal tribute collected in several of the western countries of Europe. The idea of an annual tribute seems to have originated in England before the Norman conquest, and was exacted from every householder about St. Peter's Day for the support of an English college or hospice in Rome. It was finally abolished by Elizabeth.

Peterwardein (pā-ter-vär'dīn), a town and fortress of Hungary, on the Danube, opposite Neusatz, 45 miles northwest of Belgrade, the strongest fortress on the Danube. Pop. 5019.

Petiole (pet'i-ōl), in botany, a leaf-stalk; the foot-stalk of a leaf, which connects the blade with the branch or stem.

Pétion de Villeneuve (pā-ti-on dė vēl - neuv), JERÔME, a French revolutionist, originally an advocate at Chartres, where he was born in 1753, was chosen deputy, by the tiers-état of that city, to the states-general in 1789. In October he was made a member of the Committee of Public Safety; elected president of the National Assembly in 1790; appointed president of the criminal tribunal of Paris, and became mayor of Paris in 1791. After the death of the king he was nominated a deputy to the Convention; joined the Girondists; was impeached by Robespierre; escaped from prison, and died, it is supposed, from hunger, his body, in 1794, being found in a field in the department of the Gironde half devoured by wolves.

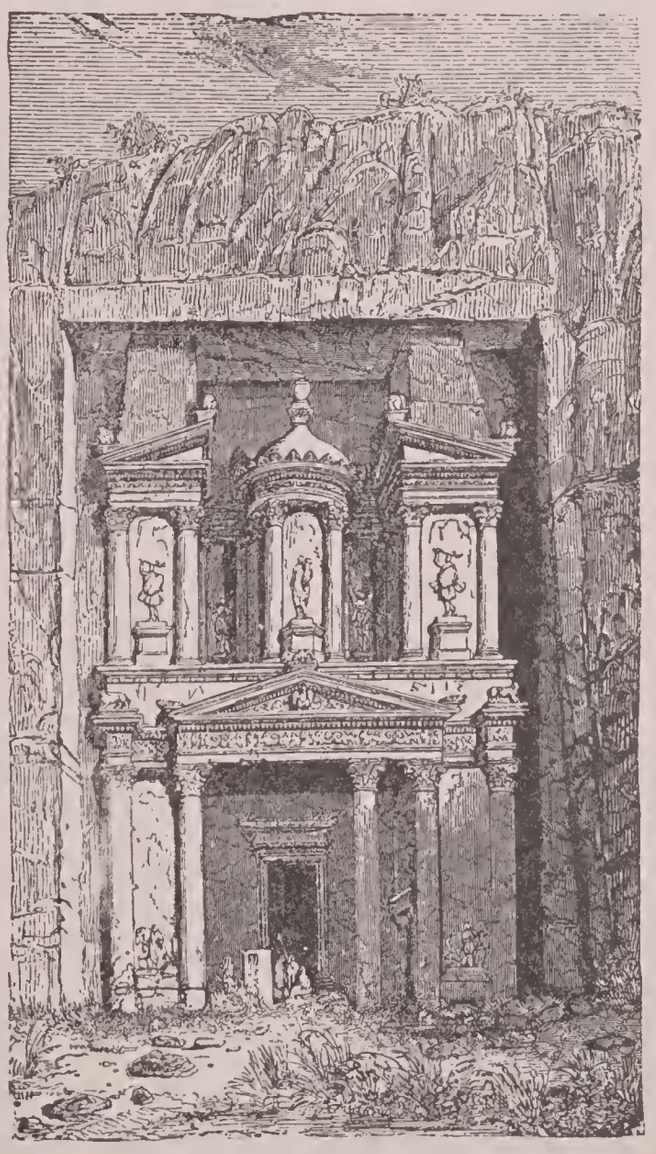
Petition (pe-tish'un), a representation of grievances with an appeal for redress. The first amendment to the Constitution of the United States provides that Congress shall make no law abridging the right of the people peaceably to assemble, and to petition the government for a redress of grievances. The right of petition has always been treated as an individual right, whereby the citizen can make his grievances known to the highest authority in the State or Union. In the anti-slavery agitation in the United States the right of petition was hotly contested; and it was finally decided that all petitions and memorials touching the abolition of slavery should be laid upon the table without debate. The Bill of Rights, which is a part of all state constitutions, perpetuates the right of petition as a fundamental right incident to the relations between the government and the people. The right of petition is widespread and has been exercised in England from very early times.

Petition of Right, in English history, a parliamentary declaration of the rights and liberties of the people, assented to by Charles I in the beginning of his reign (1628), and considered a constitutional document second in importance only to Magna Charta. The petition demanded: (1) that no freeman should be forced to pay any tax, loan, or benevolence, unless in accordance with an act of parliament; (2) that no freeman should be imprisoned contrary to the laws of the land; (3) that soldiers and sailors should not be billeted on private persons; (4) commissions to punish soldiers and sailors by martial law should be abolished.

Petitio Principii (pe-tish'i-o prin-sip'i-ī), in logic, a species of vicious reasoning, which consists in tacitly assuming the proposition to be proved as a premiss of the syllogism by which it is to be proved; in other words, begging the question.

Petit Jury. See *Jury.*

Petöfi (pe-teu'fē), SANDER, a Hungarian poet, born in 1823. In his youth he was for some time a common soldier and then a strolling player; in 1843 he contributed to the journals sev-



Khasné or Treasury. Petra.

eral poems which attracted instant attention; he also wrote several dramas and novels; his lyric of *Most vagy sohã* ('Now or Never') became the war-song (1848) of the revolution; and in recognition of his lyrical fervency he has been named 'the Hungarian Burns.' In the revolutionary war he was an adjutant under Bem. Killed in the battle of Schässburg.

Petoskey (pē-tos'ki), county seat of Emmet Co., Michigan, on Little Traverse Bay, 190 miles N. of Grand Rapids. Lime, pumps, maple blocks, cement, pulp, etc., are manufactured. Pop. 5064; in summer 30,000.

Petra (pē'trâ), a ruined city, formerly the Nabathæan capital of Arabia Petræa, in a narrow valley of the Wady Musa, about 110 miles S.S.E. of Jerusalem. It appears to have been a place of considerable extent and great magnificence, for its ruins, partly temples, etc., cut out of the solid rock, cover a large space. It seems to have been the Joktheel of the Old Testament, taken by Amaziah from the Edomites.

Petrarch (pē'trârk), FRANCESCO PETRARCA, an Italian poet and scholar, born at Arezzo in 1304. His father being an exile from Florence, his earliest years were spent at Incisa, in the vale of Arno, and afterwards with his father at Carpentras, near Avignon, where he began his education. He afterwards studied law at Montpellier and Bologna, but his own inclinations led him to devote his time to Latin and the Provençal poets. It was at Avignon in 1327 that he first saw, in the church of St. Claire, the Laura who exercised so great an influence on his life and lyrics. Our information regarding this lady is exceedingly meager, but it is supposed that her name was Laura de Noves, that she had become the wife of Hughes de Sade two years before she was seen by Petrarch, and that she died in 1348 a virtuous wife and the mother of a large family. After this first meeting Petrarch remained at Avignon three years, singing his purely Platonic love, and haunting Laura at church and in her walks. He then left Avignon for Lombez (French department of Gers), where he held a canonry gifted by Pope Benedict XII, and afterwards visited Paris, Brabant, Ghent, the Rhine, etc. In 1337 he returned to Avignon, bought a small estate at Vaucluse, in order to be near Laura, and here for three years wrote numerous sonnets in her praise. It was upon his Latin scholarship, however, that he rested his hopes of fame. His Latin works were highly esteemed, and in 1341 he was called to Rome to receive the laureate crown awarded for his Latin poem of *Africa*, an epic on the Punic wars. At Parma he learned of the death of Laura, which he recorded on his copy of Virgil, and celebrated in his *Triumphs*. A large part of his time was employed in various diplomatic missions, and in 1370 he took up his residence at Arqua, near Padua, where he passed his remaining years in religious exercises, dying July 18, 1374. Among his Latin

Francesco Petrarca.

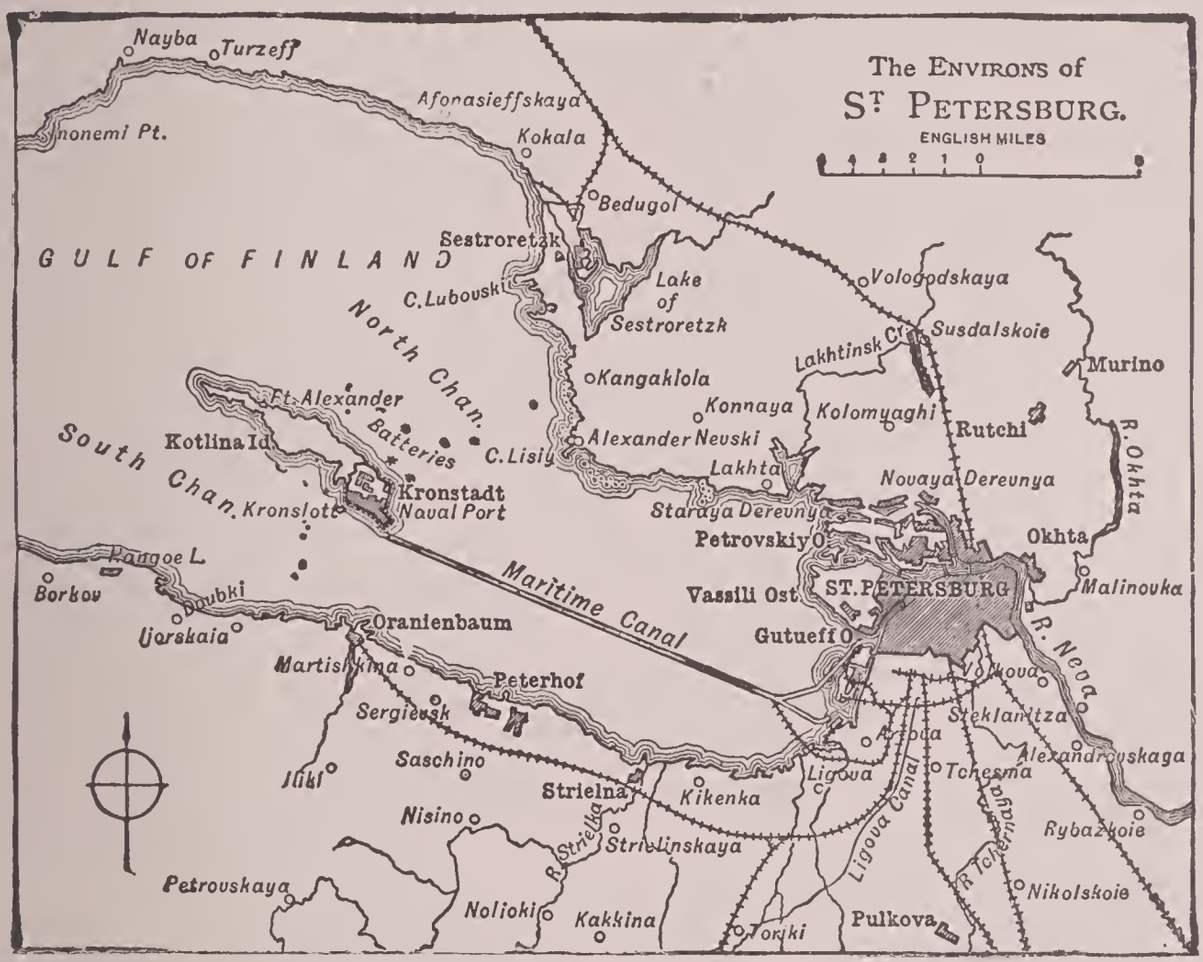
works are three books of Epistles (*Epistolæ Familiares*) and twelve Eclogues, his poem *Africa*, various philosophical, religious, political, and historical treatises; his Italian poems, on which his fame now entirely rests, chiefly consist of *Sonetti and Canzoni in Vita e in Morte di Laura*, and of *Trionfi* ('Triumphs'), a series of allegorical visions. His poems had an important influence on the development of Italian and modern European poetry.

Petrel (pet'rel), the common name of the web-footed oceanic birds of the family Procellaridæ. The petrels are nocturnal in their habits, breed in holes in the rocks, lay but one egg, and are almost all of small size and more or less somber plumage. The smaller species are well known to sailors under the name of Mother Carey's chickens, and their appearance is supposed to presage a storm. The term stormy petrel is more exclusively applied to the *Thalassidrŏma pelagica*, a bird which seems to run in a remarkable manner along the surface of the sea, where it picks up its food.

Petrie (pē'tri), WILLIAM MATTHEW FLINDERS, archæologist, born

at Charlton, England, in 1853. He studied and wrote a work on *Stonehenge* in 1880, then studied the pyramids and temples of Gizeh, Egypt, and afterwards the temple at Tanis and other ancient cities, making many interesting discoveries. His *Ten Years' Diggings* and other works are valuable.

Petrifaction (pet-ri-fak'shun), a name given the organic bodies (animal or vegetable) which have, by slow process, been converted into stone. The term is used in much the same sense as *fossils.*



Petrikau, or **Petrokoff.** See *Piotrkov.*

Petrobrusians (pē-tro-brū'shanz), the followers of Peter (Pierre) de Bruys, a Provençal, who in the beginning of the 12th century preached against the doctrine of baptismal regeneration, the use of churches, altars, crucifixes, relics, etc., prayers for the dead, and the doctrine of the real presence.

Petrograd (pe-trō-grād), originally St. Petersburg, the capital of the Russian empire, situated at the head of the Gulf of Finland, at the mouth of the Neva, 400 miles from Moscow. The Neva, before entering the Gulf of Finland, forms a peninsula on which the main part of the city stands, and itself divides into several branches, thus forming numerous small islands. The ground is low, and extensive portions of both the islands and the mainland are flooded every winter. The Kronstadt Canal, connecting Petrograd with Kronstadt, admits vessels of largest size, and has made Petrograd an important seaport, the chief port in Russia for the export of raw material and the import of manufactured goods. The Neva is frozen for an average of 147 days in the year and is unnavigable for a longer time because of ice from Lake Ladoga. It is crossed by three beautiful permanent bridges—the Nicholas, the Trinity, and the Alexander—and the central and wealthier portions of the city have wide, straight streets and large open spaces. The Admiralty, on the mainland, is the focus of the city, and is now the seat of the ministry of the navy, while the new Admiralty stands farther down the Neva. The Admiralty is surrounded by a broad square. To the west, opposite the senate, stands a splendid bronze statue of Peter the Great, erected in 1782; and to the east is the imperial winter palace, a work

of admirable proportions, designed by Rostrelli (1764.) A gallery joins the palace with the Hermitage Fine Arts Gallery, which contains a wealth of masterpieces of Rembrandt, Velasquez, Murillo, etc., and a valuable collection of antiquities. A broad semicircular square, containing the Alexander I column (1834), separates the palace from the buildings of the general staff and the foreign ministry. The Cathedral of St. Isaac, (built 1819–58), near the statue of Peter the Great, is an imposing pile. The Imperial Library (1814) ranks next after those of Paris and London and contains many valuable manuscripts, among them the Codex Sinaiticus, one of the oldest manuscripts of the Old Testament. Petrograd is also the seat of many learned societies. The eastern extremity of Vasilyeoskiy Island is the center of commercial activity and contains the stock exchange; and this island also contains numerous scientific and educational institutions—the university, the academy of sciences, the academy of arts, the marine academy, the mining institute, and the central physical observatory. Petersburg Island contains the fortress of St. Peter and St. Paul, now used as a state prison, mint, and artillery museum. Apothecaries' Island, to the north, contains a botanical garden of great scientific value. There are two government dockyards. The large factories are outside the limits of Petrograd, only a few industrial establishments within the city employing more than twenty workmen. The city is really much less a manufacturing city than Moscow or Berlin, and only the great influx of functionaries, consequent upon the state taking into its hands the administration of the railways and spirituous liquors, saved it from losing its relative importance as an industrial center in favor of the Baltic ports of Riga and Libau. The chief industries are cottons and other textiles, metal and machinery, tobacco, paper, soap and candles, chemicals, breweries, distilleries, sugar refineries, shipbuilding yards. printing plants, potteries, carriage works, etc. The chief export is grain; the chief imports, coal, metals, building material, herring, coffee, tea, etc. Six railways meet at Petrograd, but the Neva is the principal channel for trade with the rest of Russia by means of the Volga and its tributaries. The region between Lake Ladoga and the Gulf of Finland was inhabited in the ninth century by Finns and a few Slavs. Novgorod and Pskov, eager to secure dominion over this region, built forts at the point where the Neva issues from Lake Ladoga. Sweden also erected several forts and finally secured dominion over the territory south of the Neva. Peter the Great, after taking several of the Swedish fortresses, laid in 1703 the foundations of the cathedral of St. Peter and St. Paul, and of a fort which was named for him, and compelled people to settle. The city continued to grow and gradually became the export harbor for more than half of Russia. Under its old name of St. Petersburg it was the center of the intellectual life of the country, and handed on to the Russian people the results of European science and philosophy. At the beginning of the Great war (1914) it was the fifth city of the world in point of size, ranking after London, New York, Paris, Chicago. The great number of scientific, literary, artistic and technical institutions, as well as the development of the press and of music, attracted people not only from the Russian provinces but from all over Europe. With the revolution of March, 1917, which began here (see *Russia*) and the rise of the Bolsheviki, the seat of government was transferred to Moscow, and Petrograd greatly declined in population. Pop. (1915) 2,318,000.

Petrography (pē-trog'ra-fi), that branch of geology which deals with the rocks of the earth's surface, considered in relation to their mineral constituents, texture, and other physical characteristics.

Petroleum (pe-trō'le-um), a variety of naphtha, called also rock or mineral oil; a liquid, inflammable substance, in certain localities exuding from the earth, in some places collected on the surface of the water in wells, in other places obtained in great quantities by boring. It is essentially composed of a great number of hydrocarbons; is unctuous to the touch; exhales a strong odor; flows chiefly from beds associated with coal strata; and is found in enormous quantities in various parts of the United States and Russia (in the latter at Baku on the Caspian); in smaller quantities in many other countries. It yields kerosene, paraffin, and paraffin oil, so extensively employed for illuminating purposes; also lubricating oil and vaseline; and has been largely employed as liquid fuel in factories, locomotives, and steamships. Steamers, specially constructed with tanks, are now engaged in its transport. The greatest and most remarkable development of the petroleum industry began in 1859, when a company 'struck oil' by boring at Oil Creek, Pa., and obtained a supply of 400 gallons a day. This led to numerous other borings, and the oil was obtained in such quantities that towns of

considerable size soon sprang up in the oil district, railways were constructed, immense reservoirs were made, and long lines of oil pipes laid down, while large fortunes were realized. At first the borings were not very deep, and the oil generally flowed naturally; subsequently deeper borings were necessary, and the oil could only be raised to the surface by pumping. The United States leads the world both in the production, facilities of handling and refining. The oil-fields are well distributed throughout the country, and, although Pennsylvania is still a great producer, other fields have been opened up. The coast ranges of Southern California, principally in Ventura and Los Angeles counties, after abortive borings by inexperienced persons, were taken up by Pennsylvania and New York people versed in the business, and have since produced steadily and largely. California and Oklahoma now lead in production, and Illinois, West Virginia, Ohio, and Texas have also been found to contain profitable oil-belts. Several other states are also producers, Colorado and Wyoming producing an oil of much higher gravity than most of the others. Nearly 400,000,000 barrels (of 42 gallons each) of petroleum are estimated to be now produced annually in the world. Of this great total about 250,000,000 (a great advance within the past ten years) are produced in the United States, 90,000,000 in Russia, and 25,000,000 in Mexico, with minor yields in other localities. Both the American and Mexican yields are steadily increasing.

Petrology, (pe-trol'ō-ji), the science of the composition of rocks of mineral formation.

Petromyzontidæ, (pe-trom-i-zon'ti-dē), the name given to a family of animals in allusion to the manner in which they remove small stones from their breeding-grounds — formed from the Greek *Petra*, a rock; *myzone*, sucking. They comprise the family known as lampreys. Their form is eel-like, the skin naked, the head of the adult is elongated, the dorsal, anal, and caudal fins represented by a continuous or interrupted membrane; the pectorals and ventrals not developed. All the species undergo a metamorphosis, a very different form being possessed by the young or larvæ.

Petro'nius Ar'biter, a Latin writer, notorious for his licentiousness, was born at Marseilles, and lived in the court of Nero. He is supposed by many authorities to be the author of *Satyricon Libri*, a work of fiction of great ability and licentiousness, of which only fragments have been preserved.

Petropavlovsk (pye-trō-päv'lofsk), a town and harbor of Asiatic Russia, formerly capital of Kamtchatka, on the east coast of Kamtchatka. It is now of little importance, its naval institutions having been transferred to Nikolaievsk.— Also a town of Central Asiatic Russia, in the government of Akmollinsk, on the Ischim. Pop. 21,796.

Petropolis (pā-trop'o-lēz), a town of Brazil, in the province of Rio de Janeiro, and 25 miles by rail from the city of that name. Pop. about 10,000.

Petroselinum (pet-rō-se-lī'num). See *Parsley.*

Petrovsk (pye-trofsk'), a town of Russia, in the government and 70 miles N.N.W. of the town of Saratov. Pop. 9806.

Petrozavodsk (pye-trō-za-votsk'), a town in Russia, capital of the government of Olonetz, on Lake Onega, 192 miles northeast of St. Petersburg. It has an important government marine and cannon foundry, and manufactures of iron and copper ware. Pop. 12,965.

Petsh, or IPEK, a town of European Turkey, in Albania, 73 miles N.E. of Scutari. Pop. about 12,000.

Pettie (pet'ti), JOHN, a distinguished painter, born at Edinburgh in 1839; studied there at the Royal Scottish Academy; exhibited *The Prison Pet* (1859) at Edinburgh, and began in the following year to exhibit in London. Remarkable alike for vigorous conception and technical dexterity his historical and *genre* paintings were numerous. Of these may be mentioned *The Drumhead Court-martial* (1864), *Disgrace of Wolsey* (1869), *Sword and Dagger Fight* (1877), *Two Strings to Her Bow* (1887), *The Traitor* (1888), and *Portraits* (1889). He was elected A. R. A. in 1866, and R. A. in 1873. He died in 1893.

Petty (pet'i), SIR WILLIAM, statistician and political economist, born at Romsey, Hampshire, in 1623; died in 1687. He was educated in his native town and in Normandy; served for a time in the navy; studied medicine at Utrecht, Leyden, and Paris; came to Oxford, and was (1649) elected a fellow of Brasenose; became professor of anatomy (1651), and in the following year joined the army in Ireland as a physician. Here he was appointed surveyor of the forfeited Irish estates (1654), and produced the Down Survey of Irish Lands. He became sec-

retary to Henry Cromwell, the lord-lieutenant; and in 1658 entered Parliament. He wrote a *Treatise of Taxes and Contributions.*

Pettychaps (pet'i-chaps), a name given to three or four small species of warblers of the genus *Sylvia*, such as the *S. trochilus* and the *S. sibilatrix.*

Petty Officer, an officer in the navy whose rank corresponds with that of a non-commissioned officer in the army. Petty officers are appointed and can be degraded by the captain of the vessel.

Petty Sessions, in England, are sessions of two or more justices of the peace, on which power is conferred by various statutes to try minor offenses without a jury.

Petunia (pe-tū'ni-a), a genus of American herbaceous plants, nat. order Solanaceæ, nearly allied to tobacco. They are much prized by horticulturists for the beauty of their flowers.

Petuntse (pe-tun'tze), PETUNTZE, the Chinese name for what is thought by geologists to be a partially decomposed granite used in the manufacture of porcelain.

Petworth-marble, also called *Sussex-marble*, from being worked at Petworth in Sussex, a variously-colored limestone occurring in the Weald clay, and composed of the remains of fresh-water shells.

Peutingerian Table (pū-tin-jer'i-an), a table of the roads of the ancient Roman world, written on parchment, and found in a library at Speyer in the fifteenth century. It was so named from Conrad *Peutinger*, a native of Augsburg, who was the first to make it generally known. It is supposed to have been constructed about A.D. 226.

Pew (pū), a separate inclosed seat in a church. In England pews are held in the Established Church either by prescriptive right, or by the will of the bishop. In the United States pews are sold to actual owners, or rented to seat-holders at a fixed price.

Pewter (pū'ter), an alloy of tin and lead, or of tin with proportions of lead, zinc, bismuth, antimony, or copper, and used for domestic utensils. One of the finest sorts of pewter is composed of 100 parts of tin to 17 parts of antimony, while the common pewter of which beer-mugs and other vessels are made consists of 4 parts of tin and 1 of lead. The kind of pewter of which tea-pots are made (called Britannia-metal) is an alloy of tin, brass, antimony, and bismuth.

Peyer's Patches, in anatomy the lymph follicles found in the mucous membrane of the small intestine. They are usually the seat of ulceration in typhoid fever.

Peyrouse, LA. See *La Pérouse.*

Pézenas (pāz-näs'), a town of France, in the department of Hérault, on the left bank of the Hérault, at the confluence of the Peine, 25 miles W.S.W. from Montpellier. Pop. 6432.

Pezophaps. See *Solitaire.*

Pezoporus. See *Parakeet.*

Pfalz (pfälts). See *Palatinate.*

Pfeiffer (pfī'fėr), IDA, an enthusiastic traveler, born at Vienna in 1797; died in 1858. In her youth she was educated by her father into masculine habits and hardiness; and on the death of her husband, visited Turkey, Palestine, and Egypt (1842); Scandinavia and Iceland (1845); journeyed round the world in 1846–48, visiting China, India, Persia, Greece, etc.; in 1852 visited California, Peru, Oregon, etc., and in 1856 explored Madagascar. The narratives of her various journeys were translated into English.

Pfleiderer (pflī'dėr-ėr), OTTO, German philosophical theologian, born at Stetten, Wurtemberg, 1839; died, 1908. He was a pastor at Heilbronn from 1868 till 1870, when he became professor at Jena, whence he was transferred to Berlin in 1875. His philosophical views may be regarded as a blend of those of Hegel and Schleiermacher, while in criticism he leaned toward the school of Baur. His principal works are *Religionsphilosophie auf geschichtlicher Grundlage, Religion und Moral, Der Paulinismus, Grundriss des Christlichen Glaubens und Sitten-Lehre, Das Urchristenthum, Influence of the Apostle Paul, Development of Theology Since Kant, Philosophy and Development of Religion,* and *Evolution and Theology.*

Pforzheim (pforts'hīm), a town of the Grand-duchy of Baden, 15 miles S.E. of Carlsruhe, on the northern edge of the Black Forest, at the junction of the Nagold with the Enz. The chief industry is in the making of gold and silver trinkets, and the other manufactures are machinery, castings, tools, chemicals, leather, paper, cloth, etc. Pop. (1910) 69,082.

Phacochere (fak'ō-kēr), PHACOCHŒRE, the wart-hog of Africa, a pachydermatous mammal of the

genus *Phacochœrus*, akin to the swine, characterized by a large wart-like excrescence on each side of the face. The tusks of the male project 8 or 9 inches beyond the lips, and form terrible weapons. *P. Eliani* is the Abyssinian phacochere or Ethiopian wild-boar.

Phacops (fa'kopz), a genus of fossil trilobites. *P. latifrons* is characteristic of the Devonian formation, and is all but world-wide in its distribution.

Phædo (fē'dō), a Greek philosopher, a scholar of Socrates, and founder of a school of philosophy in Elis. The dialogue of Plato on the immortality of the soul, which contains the conversation of Socrates in prison before his death, bears the name of Phædo. None of his own writings are extant.

Phædra (fē'dra), in Greek mythology, daughter of Minos, king of Crete, was the sister of Ariadne and wife of Theseus. She falsely accused her stepson, Hippolytus, of a criminal attempt upon her honor, an injustice of which she afterwards repented, and was either killed by her husband or committed suicide. Sophocles and Euripides made this the subject of tragedies (both of which are lost), and their example was followed by Racine.

Phædrus (fē'drus), a Latin writer of the Augustan age, who translated and imitated the fables of Æsop. He was a slave brought from Thracia or Macedonia to Rome, and manumitted by Augustus. Some authorities have doubted the genuineness of the fables ascribed to Phædrus, but their style is favorable to the supposition of their genuineness. There are five books, containing ninety-seven fables, attributed to him. They are notable for beauty of style and purity of language.

Phaëthōn (fā'e-tōn), a mythological character, who one day obtained leave from his father Helios (the Sun) to drive the chariot of the sun, but being unable to restrain the horses Zeus struck him with a thunderbolt and hurled him headlong into the river Po. The name in its English form of *Phæton* is applied to an open four-wheeled carriage.

Phagedæna (faj-e-dē'na), in medicine, a name given to a kind of obstinate gangrenous ulcer which eats into or corrodes the adjoining parts.

Phagocytes (fag'ō-sītz), the white or colorless blood corpuscles, also called leucocytes. They are cells with active ameboid functions and engulf both nutritive and injurious substances. These cells are now known to have important physiological functions, and that to their healthy activity is due the destruction of invading bacteria.

Phalanger (fal'an-jėr), the name given to the animals of the genus *Phalangista*, a genus of marsupial quadrupeds inhabiting Australasia; also called *phalangists*. They are generally of the size of a cat, are nocturnal in their habits, and live in trees,

Vulpine Phalanger (*Phalangista vulpïna*).

feeding on insects, fruits, leaves, etc. The sooty phalanger or tapoa (*P. fuliginōsa*), so-called from its color, is pretty common in Tasmania. The vulpine phalanger or vulpine opossum (*P. vulpīna*) is another species, common in Australia. See also *Flying Phalanger*.

Phalanges (fa-lan'jėz), the name applied to the separate bones of which the digits (or fingers and toes) of vertebrates are composed. Each digit or finger of the human hand consists of three phalanges, with the exception of the pollex or thumb, which is composed of two only.

Phalansterianism, PHALANSTERISM. See *Fourier*.

Phalanx (fal'anks), a name given generally by the Greeks to the whole of the heavy-armed infantry of an army, but more specifically to each of the grand divisions of that class of troops when formed in ranks and files close and deep, with their shields joined and their pikes crossing each other. The Spartan phalanx was commonly 8 feet deep, while the Theban phalanx was much deeper.

Phalaris (fal'a-ris), a ruler of Agrigentum in Sicily (probably between 571 and 549 B.C.), chiefly celebrated in tradition for his cruelty. He is said to have burned his victims in a brazen bull, within which a slow fire was kindled. By means of pipes fitted in its nostrils the shrieks of the tyrant's victims became like the bellowing of the animal. The letters of Phalaris, of which an English edition was

published in 1695, were shown to be spurious by Richard Bentley in his *Dissertation on Phalaris* (1699). See *Bentley.*

Phalaris, a small genus of grasses, of which the seed of one of the species, *P. canariensis*, or canary-grass, is extensively employed as food for birds, and commonly known as canary-seed.

Phalarope (fal′a-rōp), the common name of several grallatorial birds forming the genus *Phalarŏpus.* The gray phalarope (*P. lobātus*), frequently seen in Britain in the course of its migration from its Arctic breeding place to its southern winter quarters, is a beautiful bird, rather over 8 inches long, with a short tail and slender straight bill. The red-necked phalarope (*P. hyperborĕus*), which breeds in some of the most northern Scottish islands, is rather smaller than the gray phalarope.

Phallus (fal′lus), the emblem of the generative power in nature, carried in solemn procession in the Bacchic orgies of ancient Greece (see *Bacchanalia*), and also an object of veneration or worship among various Oriental nations. (See *Lingam.*) In botany, *Phallus* is a genus of fungi of the division Gasteromycetes. A most common species is *P. impudīcus* or *fœtidus*, popularly called *stinkhorn*, which has a fœtid and disgusting smell.

Phanerogamia (fan-e-ru-gā′mi-a), a primary division of the vegetable kingdom, comprising those plants which have their organs of reproduction (stamens and pistils) developed and distinctly apparent. See *Botany.*

Phantasmagoria (fan-tas-ma-gō′-ri-a), a term applied to the effects produced by a magic-lantern.

Pharaoh (fā′rō), the name given in the Bible to the kings of Egypt, corresponding to the P-RA or PH-RA of the Egyptian hieroglyphics, which signifies the sun. The identification of the Pharaohs mentioned in Scripture with the respective Egyptian kings, particularly the earlier ones, is a matter of great difficulty. See *Egypt.*

Pharaoh's Rat. See *Ichneumon.*

Pharisees (far′i-sēz), a religious sect among the Jews which had risen into great influence at the time of Christ, and played a prominent part in the events recorded in the New Testament. The most probable account of the origin of the Pharisees as a distinct sect is that which refers it to the reaction against the attempt of Antiochus Epiphanes to break down the distinctions between his Jewish and his Greek subjects. At the time of Christ the Pharisees stood as the national party in politics and religion — the opponents of the Sadducees. The fundamental principle of the Pharisees was that of the existence of an oral law to complete and explain the written law. 'Moses,' said the Mishna, 'received the law (the unwritten law is meant) from Sinai, and delivered it to Joshua, and Joshua to the elders, and the elders to the prophets, and the prophets to the men of the Great Synagogue.' This oral law declared the continuance of life after the death of the body, and the resurrection of the dead. This authoritative tradition received in process of time additions which were not pretended to be derived directly from Moses: — 1st, Decisions of the Great Synagogue by a majority of votes on disputed points. 2d, Decrees made by prophets and wise men in different ages. 3d, Legal decisions of proper ecclesiastical authorities on disputed questions. These authorities comprehended both the writers of the sacred books and their approved commentators. There is no doubt that, though their strict observance of small points often led to hypocrisy and self-glorification, the sect contained a body of pious, learned, and patriotic men of progress.

Pharmacopœia (fâr-ma-ku-pē′ya; Greek, *pharmakon*, drug, *poiia*, making), a book containing the prescriptions for the preparation of medicines recognized by the general body of practitioners. Up till 1863 separate Pharmacopœias were issued by the Colleges of Physicians of London, Edinburgh, and Dublin. There is now a British Pharmacopœia, issued by the medical council of the kingdom, and an American pharmacopœia, based on that of Britain.

Pharmacy (far′ma-si), PHARMACEUTICS (Greek, *pharmakon*, drug, *pharmakeuein*, to administer drugs), the art of preparing, compounding, and combining substances for medical purposes; the art of the apothecary. As these substances may be mineral, vegetable, or animal, theoretical pharmacy requires a knowledge of botany, zoölogy, and mineralogy; and as it is necessary to determine their properties, and the laws of their composition and decomposition, of chemistry also. In a narrower sense pharmacy is merely the art of compounding and mixing drugs according to the prescription of the physician. (See *Apothecary* and *Chemists.*) In pharmaceutical operations the apothe-

caries' weight is used, in which 20 grains make a scruple, 3 scruples a drachm, 8 drachms an ounce, and 12 ounces a pound; in fluid measure 60 minims (drops) make 1 fluid drachm, and 8 drachms a fluid ounce. The following abbreviations and signs are used by physicians in writing their prescriptions: ℥, ounce; ʒ, drachm; ℈, scruple; f. ℥, fluid ounce; f. ʒ, fluid drachm; ♏, minim; Gut, (*gutta*), drop; Cochl. (*cochleāre*), spoonful; j. or i., one; ss., half; āā or ana, of each; q. s. (*quantum sufficit*), as much as necessary; p. e., equal parts.

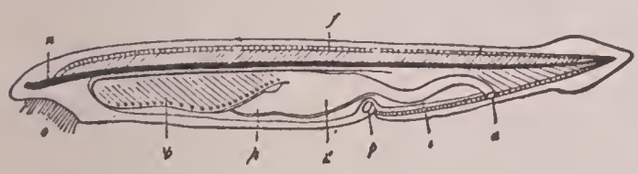
Pharnaces (far'na-sēz), a king of Pontus overthrown by Cæsar in 47 B. C., a victory announced in the famous message sent to Rome: *Veni, vidi, vici.*

Pharo, a game. See *Faro.*

Pharos (fā'ros), a lighthouse. The name is derived from the island of Pharos, close to and now part of Alexandria, which protected the port of that city. On the eastern promontory of the island stood the lighthouse of Alexandria, so famous in antiquity, and considered one of the wonders of the world, built 300 years B. C. See *Lighthouse.*

Pharsalus (far-sā'lus), a town of ancient Thessaly, near which Cæsar defeated Pompey, B. C. 48. (See *Cæsar* and *Pompey.*) It is now represented by the small town Phersala, seat of a Greek archbishop. Pop. 1363.

Pharyngobranchii (fa-rin-go-brang'ki-ī; 'pharynx-gilled'), the name applied to



Pharyngobranchii.

The Lancelet (*Amphioxus lanceolatus*), enlarged. *o*, Mouth; *b*, Branchial sac; *g*, Stomach; *h*, Diverticulum representing the liver; *i*, Intestine; *a*, Anus; *n*, Notochord; *f*, Rudiments of fin-rays; *p*, Abdominal pore.

the lowest order of fishes, represented solely by the lancelet (which see).

Pharyngognathi (fa-rin-gog'na-thī), a tribe of acanthopterous fishes, which includes the wrasses, the parrot-fishes, the garfish, saury-pikes, and flying-fish.

Pharynx (fa'ringks), the term applied to the muscular sac which intervenes between the cavity of the mouth and the narrow œsophagus, with which it is continuous. It is of a funnel shape, and about 4 inches in length; the posterior nostrils open into it above the soft palate, while the larynx, with its lid, the epiglottis, is in front and below. The contraction of the pharynx transmits the food from the mouth to the œsophagus. From it proceed the eustachian tubes to the ears.

Phascogale (fas-kog'a-le), a genus of small marsupials, closely allied to the dasyures, found throughout Australia, New Guinea, etc.

Phascolarctos (fas-kal-ark'tos). See *Koala.*

Phascolomys (fas-kol'o-mis), the generic name of the wombat (which see).

Phase (fāz), in astronomy, one of the recurring appearances or states of the moon or a planet in respect to quantity of illumination, or figure of enlightened disc.

Phaseolus (fa-sē'o-lus), the genus of leguminous plants to which belong the kidney-bean and scarlet-runner. See *French Bean.*

Phasian'idæ, PHASIA'NUS. See *Pheasant.*

Phasis (fā'sis), a river of Colchis (Transcaucasia), now called the Rion, anciently regarded as the boundary between Europe and Asia. It rises in a spur of the Caucasus, flows in a generally western direction, and falls into the Black Sea near Poti. Pheasants are said to have been first brought to Europe from the banks of this river, hence their name.

Phasmidæ (fas'mi-dē), specter insects or walking-sticks, a family of orthopterous insects allied to

Phasmidæ, or Specter Insects.

1, *Cladomorphus phyllinus* (Brazilian Walking-stick). 2, *Acrophylla chronus*, Australia.

the Mantidæ, restricted to warm countries, and remarkable for their very close resemblance to the objects in the midst of which they live, this peculiarity, known as *mimicry*, being their only protection against their enemies. The family includes the genera *Phasma*, *Phyllium*, *Cladomorphus*, etc. Some of them are destitute of wings, and have the appearance of dead twigs, while the absence of motion in the insects adds to the deception.

Pheasant (fez'ant), the general name given to birds of the family Phasianidæ, which comprises several genera besides that of the pheasants proper, *Phasiānus*. There are usually naked spaces of skin on the head or cheeks and often combs or wattles. The plumage of the males is brilliant, that of the females more sober, and the males carry spurs on the tarso-metatarsus.

Reeve's Pheasant (*Phasianus veneratus*).

The wings are short, the tail long. The three front toes are united by a membrane up to the first joint, and the hinder toe is articulated to the tarsus. The food consists of grains, soft herbage, roots, and insects. They are chiefly terrestrial in habits, taking short rapid flights when alarmed. The pheasants are polygamous, the males and females consorting together during breeding-time, which occurs in spring. The common pheasant (*Phasianus Colchicus*), now fully domesticated but originally said to be a native of the banks of the Phasis in Western Asia, is the familiar species. It extends in its distribution over Southern Europe, and is said even to exist in Siberia. These birds breed freely in a domesticated state. The pheasant will interbreed with the common fowl, the Guinea fowl, and even with the black grouse; and there are white and pied varieties of the common species. The hybrid produced by the union of a cock-pheasant with the common hen is termed a *pero*. Other species inhabiting Southern Asia and the Eastern Archipelago are the Diard's pheasant of Japan (*P. versicolor*); Reeve's pheasant (*P. veneratus*) of China; and Sömmering's pheasant (*P. Sömmeringii*), found in Japan. There are various others often put in different genera, as the firebacks, birds of rich plumage, natives of Siam and the adjacent islands; the silver pheasants (genus *Euplocămus*), of China, Burmah, and various parts of India, with a generally white plumage, the feathers marked with fine black lines; the golden pheasant of Tibet and China, the type of the genus *Thaumalea*. It is noted for its brilliant colors and magnificent crest. See also *Argus Pheasant*, *Impey Pheasant*, *Tragopan*.

Pheasant's Eye. See *Adonis*.

Pheasant Shell (*Phasianella*), a genus of gasteropodous mollusca, found in South America, India, Australia, the Mediterranean, etc. The shell is spiral and obovate, the outside polished and richly colored.

Phelps (felpz), Edward John, diplomatist, was born at Middlebury, Vermont, in 1822; died in 1900. He became professor of law at Yale in 1881, was United States minister to England 1885–89, and one of the counsel for this country in the Behring Sea arbitration of 1893.

Phelps, Elizabeth Stuart (1815-52), an American author, who also wrote under the pseudonym of 'H. Trusta.' She was born at Boston, Mass., and in 1842 married Rev. Austin Phelps (1820-90), pastor of Pine Street Congregational Church, Boston, and president of Andover Theological Seminary. Her best-known book is *Sunny Side*, which pictured life in a New England pastor's home, and which when published (1851) had a sale of 100,000 copies.

Phelps, John Wolcott, an American soldier born at Guilford, Vt., Nov. 13, 1813; died Feb. 2, 1885. Graduating from the U. S. Military Academy, he served against the Creeks and Seminoles, and commanded a company in the Mexican war. He wrote a number of anti-slavery articles, and when the Civil War broke out he took part in the expedition against New Orleans. He proceeded to organize slaves as soldiers, but the Federal government was not yet ready for this step and ordered him to cease his activities. He resigned his commission and returned to Vermont. He was the candidate of the American party for president in 1880.

Photo. by William H. Rau

BROAD STREET, PHILADELPHIA

Looking north to City Hall, an immense structure covering 4½ acres. The tower, surmounted by a colossal statue of William Penn, rises to a height of 547 feet. Broad Street is the longest straight street in the world.

Phelps, Oliver (1749-1809), an American merchant, born at Windsor, Conn. He amassed a fortune as a merchant in Suffield, Conn., and Granville, Mass. In 1787, with Nathaniel Gorham, he bought a tract of 2,000,000 acres owned by the Commonwealth of Massachusetts in what is now comprised in the counties of Ontario and Steuben, New York State, part of the region ceded to Massachusetts at the Hartford convention of 1786. He opened a land office at Canandaigua, N. Y., and invented a system of townships and ranges afterward adopted for surveying U. S. government land. In 1790 he sold his land to Robert Morris. In 1795, with others he bought the Western Reserve (q. v.) in Ohio from Connecticut, and afterward returned to Canandaigua, interesting himself in canals and ships. He was a member of congress, 1803-05.

Phelps, Samuel (1804-78), an English actor, born at Devonport, Devonshire. His first appearance was as *Shylock* in 1825. He is said to have played the leading rôle in more than thirty of Shakespeare's plays. For over twenty years he managed Sadler's Wells Theater, Islington. Consult Forbes-Robertson's *Life of Phelps.*

Phelps, Thomas Stowell (1822-1901), an American naval officer, born at Buckfield, Me. He commanded the *Juniata* in the engagements at Fort Fisher, January 13-15, 1865. Retired with the rank of rear-admiral in 1885.

Phelps, William Lyon, an American educator, born at New Haven, Conn., Jan. 2, 1865. Graduating from Yale University in 1887, he was instructor of English literature there, 1892-96; assistant professor of English language and literature, 1896-1901; and Lampson professor from 1901. Author of *Essays on Books, The Twentieth Century Theater, Teaching in School and College, Reading the Bible, Essays on Modern Dramatists,* etc.

Phenacetin (fē-nas'e-tin), or Acetphenetidine, a white crystalline coal-tar compound, employed in medicine as an antipyretic and for the relief of pain.

Phenacodus (fē-nak'o-dus, or fen-a-ko'dus), a fossil mammal, with small head and long tail, whose remains are found in the Eocene beds of America and Europe.

Phenic Acid, the former name of carbolic acid (q. v.).

Phenol (fē'nōl), a white crystalline compound ($C_6 H_5 OH$) obtained from coal tar. See *Carbolic Acid.*

Phenology (fē-nol'o-ji), the science of climatic influences on plant and animal growth, habits and distribution. This has long been a matter of observation by special investigators and all students of nature must consider it broadly and at length. The wide variation of many species, or of those of a fixed type, or group are very largely influenced by climatic conditions. Thus the seasonal pelage and plumage changes in Arctic creatures as compared to similar forms in temperate climates; thus the influence of the temperature as governing coloration, appearance and length of life of forms in high and low altitudes; thus the seasonal appearance, blossoming and seeding of plants, the migration and nesting of birds and the hibernation of mammals. Whatever the causes of bird migration it is known that it is governed by the weather. In the region about Philadelphia, where American ornithology had its beginning, the average appearance of certain spring birds from year to year strikes a close date, though exceptional seasons may show a variation of two or three weeks. The same is true of the appearance of early spring flowers. The practical value of phenological observations and deductions is seen in planting, fruiting, spraying and harvesting calendars, the prevalence of insect pests and possible drought conditions. The phenologist thus strikes a series of biological averages, out of which comes an understanding of the general subject of seasonal changes as and when affecting plant and animal life both wild and domestic.

Phenomenalism (fe-nom'e-nal-izm), that system of philosophy which inquires only into the causes of existing phenomena. The sceptical phenomenalism of Hume is now represented by *Positivism.* A phenomenalist does not believe in an invariable connection between cause and effect, but holds this generally acknowledged relation to be nothing more than a habitually observed sequence.

Phenyl (fē'nil), a monovalent radical, $C_6 H_5$, entering into the composition of benzene and other organic substances.

Pheræ (fe'rē), an ancient city of Thessaly, which under the rule of tyrants of its own became a controlling power of the whole of Thessaly, and for long made its influence felt in the affairs of Greece. In 352 B. C. it became subject, with the rest of Thessaly, to Philip of Macedon.

Pherecydes (fer-i-sī'dēz), a Greek philosopher of the 6th

century B. C., a native of the island of Syros.

Phidias (fid'i-as), a celebrated Greek sculptor, who was born about 490 B.C., and flourished in the age of Pericles, but of whose life hardly any particulars are known. Among his works were three statues of Athena which were all in the Acropolis of Athens in the time of Pausanias. One colossal statue of Athena was in bronze, and the goddess was represented as a warrior-goddess in the attitude of battle. The second and still more famous stood in the Parthenon, and was made of ivory and gold, representing Athena standing with a spear in one hand and an image of Victory in the other; it measured, with the pedestal, about 41½ feet in height. The third statue, in bronze, of a smaller size, was called emphatically the *beautiful*, on account of its exquisite proportions. Another colossal statue by Phidias, that of Zeus at Olympia, was ranked for its beauty among the wonders of the world. Zeus was here seen sitting upon a throne, with an olive wreath of gold about his temples; the upper part of his body was naked; a wide mantle, covering the rest of it, hung down in the richest folds to his feet, which rested on a footstool. The naked parts of the statue were of ivory, the dress was of beaten gold. The right hand held a Victory, and the left a scepter tipped with the eagle. The Zeus was removed to Constantinople by Theodosius I, and was destroyed by fire in 475 A. D. During the government of Pericles, which lasted twenty years, Athens was adorned with costly temples, colonnades, and other works of art. Phidias superintended these improvements; and the sculptures with which the Parthenon, for instance, among other buildings, was adorned, were partly his own work, and partly in the spirit and after the ideas of this great master. Of the merits of these we can ourselves judge. (See *Elgin Marbles*, *Parthenon*.) Phidias received great honors from the Athenians, but he is also said to have been falsely accused of peculation, and of impiety for putting his own likeness and that of Pericles on the shield of Athena. He died probably about B. C. 432.

Phigalia (fē-gā-lē'yā), a city of ancient Greece in the most mountainous part of Arcadia. On one of the mountains, Mount Cotylium, to the northeast of the site of Phigalia, is situated the temple of Apollo Epicurius, built in the time of the Peloponnesian war by Ictinus, the architect of the Parthenon at Athens, and still one of the best-preserved temples in Greece. The frieze, which was usually on the exterior of the temple, was here in the interior, and with the metopes was of Parian marble. It is now in the British Museum, and is quite complete, consisting of 23 slabs of marble 2 feet high, carved in high relief, the whole being 101 feet long. The subjects are the battle of the Lapithæ and the Centaurs, and that between the Amazons and the Greeks, the school being that of Phidias.

Philadelphia (fil-ā-del'fi-ā) (1) an ancient city of Palestine, east of the Jordan, originally Rabbath-Ammon, the ancient capital of the Ammonites. (2) An important city in the east of Lydia. See *Ala-Shehr*.

Philadelphia, a city and river port of the United States, in Pennsylvania, ranks as the third largest city in the Union. It is situated on the rivers Delaware and Schuylkill, and, following the course of Delaware Bay and River, is 96 miles from the Atlantic Ocean. New York lies 97 miles to the northeast and Washington 136 miles to the southwest. The site is nearly flat, but slopes gently towards both the Delaware and the Schuylkill. The houses are largely built of brick, with white marble trimmings. The streets were originally laid out so as to run nearly due westward from the Delaware, intersected by other streets running nearly north and south, and still almost everywhere the streets cross each other at right angles. Market Street, the great central street running east and west, and continuously built upon for several miles, has a width of 100 feet; Broad Street, the principal central street running north and south, is built upon to a much greater length, and is 113 feet in width. Most of the other chief streets vary from 50 to 66 feet broad, some of the avenues, however, being much wider. An extensive system of street railway extends through nearly all the wider streets with subway and elevated railway extending through the entire length of Market Street. A number of bridges, for railway and general traffic, span the Schuylkill and a regular service of steam-ferries across the Delaware affords communication with the New Jersey side of the river. Philadelphia is the fortunate possessor of several of the chief historical monuments of the United States, the most notable of these being the State House, containing a large room called Independence Hall, from the circumstance that the Declaration of Independence was signed there (July 4, 1776). The Liberty Bell, said to have signaled that fact to the peo-

ple, is preserved as an invaluable historic treasure. Carpenters' Hall, in which the first Congress met; Christ Church, which Washington attended while President, and other historic sites, are sedulously preserved. Among the other notable buildings are the custom-house, a white marble edifice; the United States new mint, a granite-fronted building; the post-office, a large and handsome granite structure with a dome; the new City Hall, having an elevation of 547 feet and surmounted by a colossal statue of Penn; Girard College, a fine example of the Corinthian style; the buildings of the University of Pennsylvania; the Memorial and Horticultural Halls in Fairmount Park, erected in 1876 for the Centennial Exhibition, and still retained; many handsome churches, banks, insurance offices, etc. Charitable institutions are numerous and efficient. The educational establishments include the University of Pennsylvania, with a medical department; the Jefferson Medical College; the Women's Medical College; the Medico-Chirurgical College, the Hahnemann College, the College of Pharmacy; the Academy of Fine Arts; the Drexel Institute; Temple University; the School of Industrial Art; the School of Design for Women; the Philadelphia Museums; numerous colleges and educational institutions supported by the religious denominations; Girard College, devoted to the secular education of orphan boys; and the public schools. Many of the above institutions possess extensive and valuable libraries, in addition to which are the large collections belonging to the Philadelphia Library, the Mercantile Library, the Free Library, with its many branches, the University and the Academy of Science libraries, and various others; while Philadelphia is one of the recognized centers of literary, dramatic, and artistic culture. Scientific progress is represented by the Academy of Natural Sciences, the Franklin Institute, the Philosophical Society, Historical Society, etc. In addition to the public squares the chief place of outdoor recreation is Fairmount Park, with an area of over 3000 acres, possessing much natural beauty, being well wooded, and having a great variety of surface. A handsome Parkway, adorned with magnificent buildings, is projected to connect the park entrance with the City Hall. The principal places of indoor amusements are the opera houses, theaters, numerous concert-rooms, etc. Philadelphia ranks high as a center of foreign, inland, and coasting trade. The leading articles of export are grain, provisions, petroleum, anthracite and gas-coal, iron and iron-wares, lumber, tobacco, and cotton (raw and manufactured). The principal imports consist of cotton, woolen, and flax goods, tin-plate, iron and iron-ore, chemicals, etc. The river channel is being deepened so that the largest merchant ships may reach the wharves. Philadelphia is the first manufacturing city in the United States, the carpet industry being the largest in the country. The same may be said of the locomotive industry, the largest in the world, and also of the shipbuilding industry of the city and its environs. The other leading manufactures are iron and steel, machinery and tools, refined sugar, clothing, boots and shoes, brewery products, chemicals, household furniture, and a great variety besides.— Philadelphia was founded and named by William Penn in 1682 as the capital of his colony of Pennsylvania. For a long time it was almost exclusively occupied and controlled by Quakers. Many of its most important improvements were due to Benjamin Franklin, and it played a most prominent part during the Revolutionary war. In May–November, 1876 (a hundred years after the issue of the Declaration of Independence), a Centennial Exhibition, the first World's Fair in the United States, was held on the grounds at the southwest extremity of Fairmount Park. It was a large and imposing display of art and industry and has left the city two well-filled structures, the Horticultural and Memorial halls. The city has magnificent railroad terminals. The Pennsylvania Railroad station, completed in 1894, is of modern Gothic, absolutely fireproof; the train shed is one of the largest single spans ever constructed, being 304 ft., covering sixteen tracks. The Philadelphia & Reading Railroad terminal is of composite Renaissance, and built of New England granite, brick, and terra-cotta. The train shed has a clear span of 266 ft., covering thirteen tracks. Of more recent construction is the Baltimore & Ohio Railroad terminal, a handsome structure. All these run, by underground or elevated tracks, to the center of the city. No city in the Union is better provided with freight terminals than Philadelphia. The area of the municipality is 130 sq. miles, embracing the whole county. Of this a considerable portion in the northern section is rural in character, but the greater part of the area is closely built over, the city containing an enormous number of well-built two-story residences. Initial steps have been taken to erect a bridge across the Delaware. Pop. (1900) 1,293,697; (1910) 1,549,008; (1920) 1,823,158.

Philately (fi-lat'i-li; Gr. *philos*, loving; *atelēs*, free of tax), the name given to the study and collection of stamps, stamped envelopes, etc. The first systematic collection of stamps is credited to a Frenchman about the year 1862. There are now enthusiastic collectors throughout the world. The Philatelic Society of London was founded 1869; the American Philatelic Society in 1886.

Philemon (fil-ē'mon), EPISTLE OF PAUL TO, one of the books of the New Testament. This epistle, according to the prevalent opinion, was, together with the Epistles to the Ephesians, Colossians, and Philippians, written from Rome during St. Paul's first imprisonment in that city. The only doubt thrown on this opinion by those who accept the genuineness of the epistles is contained in the suggestion supported by Meyer and others, that these epistles were written during the apostle's imprisonment at Cæsarea.

Philidor (fil'i-dor), FRANÇOIS ANDRÉ DANICAN, a French musical composer and celebrated chess player; born in 1726; died in 1795. In early youth he was a chorister in the chapel of Louis XV, and afterwards supported himself as a teacher and copier of music. He traveled in Holland, Germany, England, etc., and in 1753, when in England, he set Dryden's *Ode for St. Cecilia's Day* to music. He had while here devoted his attention principally to chess; and he gained extended fame from having published his analysis of the game, which is still referred to as an authority. On his return to France, in 1754, he produced about twenty operas at the Opéra Comique. He went to London in 1779, where he produced the music to Horace's *Carmen Seculare*, his best work. Having been pensioned for his services he abandoned musical composition altogether, in 1788, in order to give himself up entirely to chess.

Philip (fil'ip), one of the twelve apostles, according to John's gospel 'of Bethsaida, the city of Andrew and Peter,' and who was called to follow Jesus at Bethany. After the resurrection he was present at the election of Matthias to the apostleship, but is not again mentioned. In the Western church he is commemorated on May 1.— PHILIP THE EVANGELIST, often confounded with the above, is first mentioned in Acts vi, 5. He preached at Smyrna, where Simon Magus was one of his converts; baptized the Ethiopian eunuch; entertained Paul and his companion on their way to Jerusalem, when 'he had four daughters which did prophesy.'

Philip II, King of Macedon, the most famous of the five Macedonian kings of this name, and the father of Alexander the Great, was a son of Amyntas II, born B.C. 382. He passed a portion of his early years in Thebes, where he became well acquainted with Greek literature and politics, and succeeded his elder brother, Perdiccas, in 360. His position at first was not very secure, but as he had few scruples and was a man of the highest talents both for war and diplomacy, in a short time he had firmly established himself, had reorganized the Macedonian army, and proceeded to extend his sway beyond his own kingdom. His ambition was to make himself, in the first place, supreme in Greece, and to accomplish this he began by seizing the Greek towns on his borders: Amphipolis, which gave him access to the gold-mines of Mount Pangæus, Potidæa, Olynthus, etc. The 'sacred war' carried on by the Amphictyonic council against the Phocians gave Philip his first opportunity for interfering directly in the affairs of Greece. (See *Greece.*) After the capture of Methone — the last possession of the Athenians on the Macedonian coast — between 354 and 352, Philip made himself master of Thessaly, and endeavored to force the pass of Thermopylæ, but was repulsed by the Athenians; Philip, however, compensated himself by equipping a navy to harass the Athenian commerce. The terror of his name now provoked the 'Philippics' of Demosthenes, who endeavored to rouse the people of Athens to form a general league of the Greeks against him; but by 346 he was master of the Phocian cities and of the pass of Thermopylæ, and as general to the Amphictyonic council he was the crowned protector of the Grecian faith. In the spirit proper to his office he marched into Greece to punish the Locrians for an act of profanity; but instead he seized the city of Elatea, and began to fortify it. Demosthenes now exerted all his eloquence and statesmanship to raise the ancient spirit of Grecian independence, and a powerful army was soon in the field, but being without able or patriotic commanders it was defeated at the decisive battle of Chæroneia in August, 338 B. C. After this last struggle for freedom Philip was acknowledged chief of the whole Hellenic world, and at a congress held at Corinth he was appointed commander of the Greek forces, and was to organize an expedition against Persia. While preparing for this enterprise he was murdered in 336 B. C., some say at the instigation of his wife Olympias.

Philip I, King of France, son of Henry I, was born 1052, and succeeded to the throne under the guardianship of Baldwin V, count of Flanders, in 1060. The Norman conquest of England took place in his reign, and he supported Prince Robert, son of the Conqueror, in his revolt against his father. He was a worthless debauchee and was detested by his subjects. He died in 1108.

Philip II, Augustus, King of France, born 1165, was crowned as successor during the lifetime of his father, Louis VII, whom he succeeded in 1180. One of his first measures was the banishment of the Jews from the kingdom, and the confiscation of their property. Philip next endeavored to repress the tyranny and rapacity of the nobles, which he effected partly by art and partly by force. In 1190 he embarked at Genoa on a crusade to the Holy Land, where he met Richard Cœur de Lion, who was engaged in the same cause in Sicily. The jealousies and disputes which divided the two kings induced Philip to return home the next year. He invaded Normandy during Richard's captivity (1193), confiscated the possessions of King John in France after the death of Prince Arthur (1203), prepared to invade England at the instance of the pope (1213), turned his arms against Flanders and gained the celebrated battle of Bouvines (1214). He died in 1223.

Philip III, called the *Hardy*, King of France, was the son of Louis IX and Margaret of Provence. He was born in 1245, and succeeded his father in 1270. In 1271 he possessed himself of Toulouse on the death of his uncle, Alphonso; in 1272 he repressed the revolt of Roger, count of Foix, and in 1276 sustained a war against Alphonso X, king of Castile. The invasion of Sicily by Peter of Aragon, and the massacre of the French, known as 'the Sicilian vespers,' caused him to make war against that prince, in the course of which he died, 1285.

Philip IV (Le Bel), King of France, was born in 1268, and succeeded his father in 1285. He had already married Joanna, queen of Navarre, by which alliance he added Champagne as well as Navarre to the royal domain, which he made it his policy still further to increase at the expense of the great vassals. He even attempted to take Guienne from Edward I of England, but afterwards entered into an alliance with that monarch, and gave him his daughter in marriage (1299), from which originated the claim of Edward III on the crown of France. He was long engaged in war with Flanders, which resulted in the accession of the Walloon territory to France, and the restoration of the rest of Flanders to its count on condition of feudal homage. Philip had been engaged at the same time in a violent dispute with Pope Boniface VIII, in which he was supported by the States-general, and he publicly burned the pope's bull excommunicating him. On the death of Boniface and of Benedict XI, Clement V, who succeeded the latter, was elected by the influence of Philip, and fixed his residence at Avignon. Clement before his election entered into a regular treaty as to the terms on which he should receive the pontificate. The destruction of the order of the Templars (1307–12), and the seizure by the king of their goods and estates, was one of the fruits of this alliance. Philip left numerous ordinances for the administration of the kingdom, which mark the decline of feudalism and the growth of the royal power. He also convoked and consulted the States-general for the first time. He died in 1314.

Philip VI, of Valois, King of France, was the nephew of Philip IV, to whose last son, Charles IV, he succeeded in virtue of the Salique law. He was born in 1293, and succeeded to the crown in 1328. In his reign occurred the wars with Edward III of England, who claimed the French crown as grandson, by his mother, of Philip IV (see above article). Philip died in 1350. His reign was unfortunate for France by the long war which it inaugurated, known in France as the Hundred Years' war; and he has left an evil memory by his persecutions of Jews and heretics, his confiscations and exactions.

Philip II, of Spain, was the son of Charles V and Isabella of Portugal, and was born at Valladolid in 1527. He was married in succession to the Princess Mary of Portugal in 1543, and to Mary of England in 1554, the same year in which he became king of Naples and Sicily by the abdication of his father. In 1555 his father resolved to abdicate the sovereignty of the Netherlands in Philip's favor. This was done in public assembly at Brussels on October 25, 1555; and on January 16, 1556, in the same hall, he received, in presence of the Spanish grandees then in the Netherlands, the crown of Spain, with its possessions in Asia, Africa, and America. His first act was to propose a truce with France, which was broken almost as soon as concluded. In 1556 he went to England,

where he was refused the ceremony of a coronation and the troops that he demanded in aid of his war with France. These, however, were at length conceded to him by Mary, in violation of her marriage articles, and the levy, joined to the army of Emanuel Philibert, duke of Savoy, and Count Egmont, assisted to gain the battle of St. Quintin, August 10, 1557. On the death of Mary, in 1558, Philip, who was still prosecuting the war, made proposals of marriage to her successor, Elizabeth, and was refused. In 1559 the French war was concluded by the peace of Cateau-Cambrésis and the marriage of Philip to Elizabeth of France, daughter of Henry II. Philip then finally left the Netherlands, having appointed his half-sister Margaret sovereign of the provinces, his main object in returning to Spain being to check the progress which the Reformation had made

Philip II of Spain.

there. On his arrival in his native country he had the satisfaction of being present at an *auto-de-fé;* and a few years' perseverance in similar measures extinguished the cause of the Reformation, together with the spirit of freedom and enterprise in Spain. The cause of religion in France was also a constant subject of solicitude with Philip. In Naples, as in Spain, his zeal led him to persecute the Protestants; but it was in the Netherlands that his tyranny and obstinacy had their most disastrous, though ultimately fortunate, results. In 1556 the revolt of the Netherlands began, ending eventually in the separation of the seven northern provinces from the crown of Spain, and their formation into the Dutch republic. This struggle lasted about thirty years, till the close of Philip's reign. The events of this protracted struggle were varied in 1567 by a domestic tragedy — the rebellion, arrest, and suspicious death of Don Carlos, the son of Philip and his first wife Mary of Portugal. Shortly afterwards he lost the Queen Elizabeth, his third wife, and about the same time the Moors of Granada revolted, whose subjugation was effected in 1570. In 1571 the Archduchess Anne of Austria became his fourth wife, and the same year his natural brother, Don John of Austria, obtained the great naval victory of Lepanto over the Turks. In 1580 his troops under Alva subdued Portugal, of which and all its dependencies, Philip now became sovereign. About this time he found political motives for intriguing with the Huguenots in France, and twice in 1582 made offers of assistance to Henry, King of Navarre. In 1584 he renewed his alliance with the League, in order to oppose the succession of Henry to the crown of France. In 1586 Philip declared war with England. The year 1588 saw the destruction of the Armada and the descent of Spain from her position as a first-class power in Europe. The remainder of his reign was occupied with war and intrigues with France, but in 1598 the Peace of Vervins was concluded. Philip showed some disposition at the same time to make peace with England and the Netherlands, but his offers were not accepted, and he died in 1598 without recognizing the independence of the latter country or being reconciled to the former. Before his death he had bestowed the sovereignty of the Spanish Netherlands on his daughter Isabella, subject to the crown of Spain.

Philip V, OF SPAIN, the first Spanish king of the Bourbon dynasty, was born at Versailles in 1683; died in 1746. He was the grandson of Louis XIV of France, and succeeded to the crown of Spain by the will of Charles II, who died without direct heirs, as the grandson of Charles' elder sister. On the death of Charles in November, 1700, Philip was immediately proclaimed king, and was generally recognized in Spain, Naples, and the Netherlands; but the succession was contested by the Archduke Charles of Austria, whose claim was enforced by the armies of England, Holland, and Austria in the wars of the Spanish Succession, which began in 1702. By the Treaty of Utrecht (1713) he was recognized as King of Spain, but Gibraltar was lost to Spain, Minorca was also ceded to England, Sicily to Savoy, the Netherlands, Naples, and the Milanese to Austria. He married Elizabeth Farnese, niece of the Duke of Parma, in 1714,

PHILIPPINE ISLANDS
Scale of Miles
0 20 40 60 80 100
Important towns are shown in heavy face type
BATAN AND BABUYAN ISLANDS
Same scale as large map
FORMOSA
(To Japan)
Bachi Channel
IBAYAT
BATAN ISLANDS
BATAN
SABTANG
Balingtang Channel
BALINGTANG IS.
BABUYAN
CALAYAN
DALUPIRI
FUGA
CAMIGUIN
Claveria
C. Bojeador
C. Engano
Aparri
Abulug
LUZON
MANILA
Scale
0 ½ 1 Mile
Pasay
Pasig R.
Pateros
Taguig
Makati
Pandacan R.
Marikina R.
Guadalupe
Mandaluyong
San Juan
Quezon
Caloocan
Malabon
Navotas
Tondo
Sampaloc
Guiapon
San Miguel
S. Felipe Neri
Paco
Sta. Ana
Ermita
Malate
INTRA MUROS
MANILA BAY
Juan R.
TO GUAM, HAWAII AND SAN FRANCISCO
CALAGUAS IS.
CATANDUANES
MARINDUQUE
MINDORO
MASBATE
SAMAR
LEYTE
CEBU
BOHOL
NEGROS
PANAY
CUYOS IS.
CAGAYANES IS.
CALAMIANES IS.
TUBBATAHA IS.
BALABAC
BALAMBANGAN
BANGUEY
CAGAYAN DE JOLO
SULU (JOLO)
TAWI TAWI IS.
SIBUTU
BRITISH NORTH BORNEO
MINDANAO
CELEBES SEA
SULU SEA
VISAYAS
Mindoro Strait
Balabac Strait
Sulu (Jolo) Archipelago
Basilan Str.
Surigao Sea
Mindanao Sea
Illana Bay
Davao Gulf of Davao
Sarangani B.
Moro Gulf
Ragay Gulf
Lagonoy Gulf
San Miguel Bay
Sorsogon Bay
Ormoc Bay
Carigara Bay
Leyte Gulf
Sir. of Tanon
Tolon B.
Dumanjug B.
Sindangan B.
Iligan Bay
Sibuguey B.
Mayo R.
Agusan R.
Tagoloan R.
Cagayan R.
Pulangi R.
Rio Grande de Mindanao
Lingayen Gulf
Gulf of Lingayen
Manila Bay
Batangas Bay
Tayabas Bay
Lamon Bay
Dingalan Bay
Baler Bay
Palanan Bay
Divilacan Bay
Dilasac B.
Casiguran
Polillo
Palasan
Painanongan
Jomalig
Paracale
Daet
Indano
Pandon
Lagonoy
Bato
Virao
Bacacay
Gubat
Bacon
Atlag
Tobaco
Nueva Caceres
Libmanan
Lucena
Lopez
Mauban
Infanta
Real
Calauag
Tayabas
Lubang
Puerto Galera
Naujan
Pola
Mamburao
Sablayan
Santon
Simara
Romblon
Odiongan
Cajidiocan
Mangarin
Bulalacao
Looc
Sibuyan
Tablas
Semerara
Busuanga
Coron
Calamian
Linapacan
Cuyo
Quenton
Imuruan B.
Dumaran
Aracell
Malcumpo
Bahile
Puerto Princesa
Cagayancillo
Sandy
Ganeli
Calasian
Mt. Mantalingajan
Islas Bay
Marangas
Bugsuk
Balabac
Bancoran
S. Miguel
Ginapusan
Pangutaran
Pangutaran Is.
Sandakan
Bolipongpong
Magay
Siasi
Tawi Tawi
Tataan
Bongao
Sibutu
Samales Is.
Basilan
Isabela de Basilan
Las Mercedes
Zamboanga
Bolong
Ocutanga
Tupilac
St. Maria
Ticaman
Dapitan
Dipolog
Oroquieta
Jimenez
Misamis
Iligan
Maruhui
L. Lanao
Tucuran
Dinas
Malabang
Polloc
Cotabato
Cabuco
Ft. Reina
Regente
Inuc
Tuna
Kulut
Mt. Apo
L. de Liguasan
L. de Buluan
Mercedes
Davao
Samal
Luan
Macar
Bantangan
Surangani B.
Pt. Panguian
Balut
Sarangani
Mauguiles
C. San Agustin
Caraga
Manay
Mati
Sigaboy
Lianga
Bislig
Tinatuan
Tago
Catel
Quinablangan
Baganga
Cantilan
Surigao
Gigaquit
Bucas
Numancia
Siargao
Dinagat
Ramon
Maasin
Hilongas
Baybay
Homonhon
Dulag
Burauen
Tacloban
Salcedo
Guiuan
Basey
Lanang
Borongan
Sulat
Calbiga
Catbalogan
Oras
Calbayog
La Granja
Catubig
Palapag
Catarman
Bernardino Str.
San
Masbate
Sorsogon
Gubat
Bacon
Atlag
Tobaco
Bacacay
Virao
Bato
Pandon
Daet
Indano
Paracale
Jomalig
Palasan
Painanongan
Polillo
Baler
Dingalan Bay
Dilasac B.
Casiguran
Palanan Bay
Divilacan Bay
Cabagan Viejo
Ilagan
Alcala
Tuguegarao
Cauayan
Echague
Bayombong
Dupax
Agoo
Aguo
Bolinao
Gulf of Lingayen
Lingayen
Dagupan
Urdaneta
Alaminos
Bani
Iba
Capas
Tarlac
Camiling
Moncada
Sta. Cruz
S. Carlos
Bacolor
Calumpit
Malolos
Hagonoy
Balanga
Pt. Luzon
Mariveles
Cavite
Pasig
Sta. Cruz
Indang
San Pablo
Tiaul
Lipa
Lubang
Bauan
Batangas
Tayabas
Boac
Mauban
Lucena
Lopez
Libmanan
Lagonoy
Nueva Caceres
Lagonoy Gulf
Ragay Gulf
Sta. Cruz
Pt. Bondog
Santon
Simara
S. Pascual
Romblon
Surigao
Guimbalaan
Sorsogon
Buan
Bernardino Str.
Catarman
Batac
Palapag
Catubig
La Granja
Oras
Calbayog
Masbate
Calbayog
Cataingan
Calbalogan
Sulat
Borongan
Calbiga
Lanang
Basey
Carigara
Daan-Bantayan
Biliran
Sanyan
Pandan
Calivo
Capiz
Batan
Colasi
Ibajay SEA
Calingan
Bugason
Janiuay
Iloilo
Pototan
Sara
Palimpon
Bogo
Tacloban
Salcedo
Guiuan
Dulag
Burauen
Baybay
Hilongas
Homonhon
Camotes Is.
Taburan
Asturias
Cebu
Toledo
Valladolid
Isabela
Dumanjug
Barili
Carcar
Sibonga
Argao
Dalaguete
Tanjay
Bayauan
Dumaguete
Tolon B.
Siaton
Oslob
Tagbilaran
Jagna
Guindulman
Tabogon
Maasin
Ramon
Dinagat
Siargao
Numancia
Bucas
Gigaquit
Cantilan
Surigao
Bacuag
Mambajao
Camiguin
Siquijor
Tabuelan
Belingasag
Butuan
Malugan
Tagoloan
Cagayan
Talacogon
Loreto
Bislig
Lianga
Tinatuan
Tago
Agusan R.
Tucuran
Maruhui
L. Lanao
Iligan
Jimenez
Misamis
Oroquieta
Dipolog
Dapitan
Langaren
Malabang
Quinablangan
Baganga
Caraga
Manay
Mati
Sigaboy
Davao
Samal
Mercedes
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Macar
Malita
Bantangan
Surangani B.
Mauguiles
C. San Agustin
Pt. Panguian
Balut
Sarangani
Kulut
Tuna
Inuc
Ft. Reina
Regente
Cabuco
Cotabato
Polloc
Malabang
Illana Bay
Sibuguey B.
Ocutanga
Tupilac
St. Maria
Ticaman
Dapitan
Dipolog
Oroquieta
Jimenez
Misamis
Iligan
Maruhui
L. Lanao
Tucuran
Dinas
Malabang
Polloc
Cotabato
Cabuco
Ft. Reina
Regente
Inuc
Tuna
Kulut
Mt. Apo
L. de Liguasan
L. de Buluan
Mercedes
Davao
Samal
Luan
Macar
Malita
Bantangan
Surangani B.
Mauguiles
C. San Agustin
Pt. Panguian
Balut
Sarangani
Basilan Str.
Isabela de Basilan
Las Mercedes
Zamboanga
Bolong
Ocutanga
Tupilac
St. Maria
Ticaman
Dapitan
Dipolog
Oroquieta
Jimenez
Misamis
Iligan
Maruhui
L. Lanao
Tucuran
Dinas
Malabang
Polloc
Cotabato
Cabuco
Ft. Reina
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L. de Liguasan
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Pangutaran
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Magay
Siasi
Tawi Tawi
Tataan
Bongao
Sibutu
Samales Is.
Basilan
Isabela de Basilan
Las Mercedes
Zamboanga
Bolong
Ocutanga
Tupilac
St. Maria
Ticaman
Dapitan
Dipolog
Oroquieta
Jimenez
Misamis
Iligan
Maruhui
L. Lanao
Tucuran
Dinas
Malabang
Polloc
Cotabato
Cabuco
Ft. Reina
Regente
Inuc
Tuna
Kulut
Mt. Apo
L. de Liguasan
L. de Buluan
Mercedes
Davao
Samal
Luan
Macar
Malita
Bantangan
Surangani B.
Mauguiles
C. San Agustin
Pt. Panguian
Balut
Sarangani
A 118° B 120° C 122° D 124° E 126° F
1 2 3 16 18 20 22 6 8 10 12 14
120° Longitude East from Greenwich

and Alberoni, the minister of the Duke of Parma in Spain, became prime-minister. As Philip had a son by his first wife, the daughter of the Duke of Savoy, the children of Elizabeth could not succeed to the crown of Spain. Elizabeth wished to provide for them in Italy, and even coveted the reversion of the crown of France. These pretensions formed the basis of schemes on Alberoni's part which alienated France and led to the Triple Alliance, formed in 1717 by Great Britain, France, and Holland against Spain, and which was afterwards merged by the accession of Austria into the Quadruple Alliance. The invasion of Spain by the Duke of Berwick compelled Philip to accede to the terms of the alliance. In 1724 Philip resigned the crown of Spain in favor of his son Don Louis, but the death of Louis a few months later induced him to resume the royal power. He died in 1746, after a reign of forty-six years. Philip was constantly governed by favorites, and his constitutional melancholy at last completely incapacitated him for business.

Philip, THE BOLD, Duke of Burgundy, born in 1342, was the fourth son of John, king of France. He fought at Poitiers (1356), where, according to Froissart, he acquired the surname of the Bold. He shared his father's captivity in England, and on his return his father, whose favorite he was, made him Duke of Touraine, gave him the Duchy of Burgundy, and made him premier peer of France. He was one of the most powerful French princes during the minority of Charles VI, during whose insanity he acted as regent, retaining the regency till his death in 1404.

Philip I (THE MAGNANIMOUS), Landgrave of Hesse, born in 1504. He began to reign at the age of fourteen, and introduced the Lutheran religion into Hesse in 1526. In 1527 he founded the University of Marburg, subscribed the protestation to the Diet of Spires in 1529, submitted the Confession of Faith at Augsburg in 1530, and in 1531 formed with the Protestant princes the Schmalkalden League. He was forced to submit to the Emperor Charles V in 1547, who kept him a prisoner for five years. After his return to his dominions he sent a body of auxiliaries to assist the French Huguenots. He died in 1567.

Philiphaugh (fil'ip-hou), a locality in Scotland 2 miles S.W. of Selkirk, the scene of Sir David Leslie's victory over the Marquis of Montrose, September 13, 1645. A monument marks the field.

Philippeville (fil'ip-vil), a city and port of Algeria, in the province and 39½ miles N.N.E of Constantine. It was founded in 1837, is well laid out, has several spacious squares and fine streets; is connected by rail with Constantine, and has considerable trade. Pop. (1906) 16,339.

Philippi (fil-ip'i), a city of Macedonia, now in ruins, founded by Philip of Macedon about B. C. 356. The two battles fought in B. C. 42, which resulted in the overthrow of Brutus and Cassius by Antony and Octavius, were fought here. Philippi was visited on several occasions by the apostle Paul, who addressed to the church there one of his epistles.

Philippians (fil-ip'i-anz), EPISTLE TO THE, one of St. Paul's epistles, is supposed to have been written from Rome towards the close of his first imprisonment there, about A. D. 63. Some authorities suppose it to have been written in Cæsarea. The genuineness of this epistle has been little questioned. It is referred to, though not quoted, in the epistle of Polycarp and by Tertullian and other early fathers. Epaphroditus, who conveyed it, was the messenger of the Philippians to Paul, and had been ill at Rome, which had been a cause of anxiety to the Philippians. Paul, therefore, hastened his return, and sent this epistle by him.

Philippics (fil-ip'iks), the name given to three celebrated orations of the Greek orator Demosthenes against Philip, king of Macedon (352–342 B. C.). This name was also applied to Cicero's fourteen speeches against Antony, and it has hence come to signify an invective in general.

Philippine Islands (fil'i-pin or -pēn), an archipelago forming part of the Malay Archipelago, in the Indian Ocean, north of Borneo and Celebes, south of Formosa (Taiwan), and about 500 miles from the S. E. coast of China, between 4° 40′ and 21° 10′ N. latitude and 116° 40′ and 126° 34′ E. longitude. In all there are 3141 islands. Total land area, 121,935 square miles. The larger islands are Luzon (40,969 sq. miles), Mindanao (36,292 sq. miles), Panay, Negros, Cebu, Leyte, Samar, and Bohol.

The shore lines and internal surface of the larger islands are extremely rugged and irregular. They are largely of volcanic formation and are traversel by irregular chains of mountains, trending generally N. and S. The mountain ranges are clothed with rich vegetation, and between

them lie extensive slopes and plains of tropical fertility, watered by numerous lakes and rivers. The climate on the whole is healthy, though cyclonic storms of wind and rain, known as typhoons, occur at certain seasons and sometimes cause considerable destruction. There are occasional earthquake shocks, presumed to radiate from Taal (q. v.) in Luzon. Among the minerals are gold, coal, copper and iron.

One of the leading industries is the growing of cocoanuts and the manufacture of cocoanut oil from the copra, which is the dried kernel of the cocoanut. Numerous cocoanut-oil mills have been established to meet the great demand for cocoanut oil, which is one of the best ingredients of artificial butter. Abaca, or Manila hemp, is another commercial product of prime importance. Tobacco is raised in many of the islands, and there is a very large trade in cigars and cigarettes. There are many thousand acres of land under cultivation in sugar cane. Rice is grown throughout the islands, but it is also imported to some extent. Cacao is raised in the southern islands.

The textile productions of the Philippines are considerable in number, ranging from the delicate pina cloth to coarse cottons, sacking, and mats. Within recent years there has been a tremendous development of the embroidery industry, from imported materials. Lumber and pearls and pearl shells are also exported. The imports are cotton goods, iron and steel manufactures, rice, flour, paper, automobiles, leather, chemicals, drugs, meat and dairy products, etc. The largest portion of trade, both export and import, is with the United States. Several banks have been established, notably the Philippine National, organized in 1916, with resources of $5,900,000; resources in 1919, $124,399,039.

Of the 12,000,000 people (1919 estimate) in the Philippine Islands, about 800,000 are classed as non-Christian, some pagan and some Mohammedan. The most numerous of the non-Christian are the Moros, who inhabit the Sulu Archipelago and certain parts of Mindanao. The vast bulk of the population is of Malayan origin. The aboriginal race is the dwarf, black people—the Negrito—but these are becoming extinct. The seven large groups of Christian inhabitants are the Visayan, Bicol, Tagalog, Pampangan, Pangasinan, Ilocano, and Ibanag (Cagayan). These seven groups are believed to represent a second Malayan migratory wave subsequent to that of the earlier Igorot and comparable tribes. Many dialects are spoken throughout the islands, but great advance has been made in the dissemination of English, and English is fast becoming universal in the islands, as it is throughout the Orient. The largest city and chief seaport, as well as the seat of government, is Manila (estimated pop, 1919, 300,000).

The Philippines were discovered by Magellan in 1521. In 1565 the Spaniards made the first permanent settlement at Cebu. In 1570 they occupied Manila and were in control till 1898. During the war with Spain (see *United States*), an American fleet under Dewey (q. v.) attacked and destroyed the Spanish fleet, and on August 13 Manila was taken. The Filipinos, then in revolt against Spain, under Aguinaldo (q. v.) continued in arms against the Americans until March, 1901, when Aguinaldo was captured. By the treaty of peace with Spain the Philippine Islands were ceded to the United States.

With a view to ultimate self-government in the islands, the United States worked out a program of education to which the Filipinos were quick to respond. There are now nearly 5000 schools supported by the Philippine government, providing instruction for 675,000 pupils The University of the Philippines, established 1908, has courses in medicine, engineering, arts, law, education and agriculture.

The first Civil Governor was Judge (later President) W. H. Taft, president of the Philippine Commission, appointed by President Roosevelt. A Philippine Assembly was formed and convened for its first session in 1907. The Jones law of 1916, passed by the U. S. Congress during President Wilson's administration, gave the Filipinos a completely elective legislature, composed of a Senate and House of Representatives.

Philippsburg (fil'ipz-burg), a town of Baden, on the right bank of the Rhine, 16 miles north of Carlsruhe, formerly a celebrated imperial fortress. In 1734 it was captured by the French under the Duke of Berwick (who lost his life here), and its fortifications were razed in 1800. Pop. about 2500.

Philips (fil'ipz), AMBROSE, a poet and dramatic writer, born of a Leicester family in 1671; died in 1749. He was educated at St. John's College, Cambridge, and subsequently became one of the wits who frequented 'Button's' in London. As a Whig politician he obtained various lucrative posts from the House of Hanover, while as a poet he was ridiculed by Swift and Pope, receiving the nickname of 'Namby Pamby' (which has since formed a useful English adjective). He wrote six pastorals and three tragedies: the *Distrest Mother* (1712), taken from Racine; the *Briton* (1722), and *Humphrey, Duke of Gloucester* (1723).

Philips, JOHN, an English poet, born in Oxfordshire in 1676; died at Hereford in 1708. He was educated at Christ Church, Oxford, where he produced the *Splendid Shilling*, a burlesque poem in Miltonic blank verse. He subsequently wrote *Blenheim*, a poem in celebration of the Duke of Marlborough's victory; and *Cyder*, a work in imitation of Virgil's *Georgics*.

Philistines (fil-is'tīnz), the name of a Semitic people or race who inhabited the southern part of the lowlands of Palestine, from the coast near Joppa to the Egyptian desert south of Gaza. They occupied five chief cities (Ashdod, Gaza, Gath, Askelon, Ekron), and these formed a kind of confederacy under five lords or chiefs. Mention is made of this people in Genesis xxi, xxvi, but it was during the time of the Judges in Israel, and subsequently in the reigns of Saul and David, that the Philistines attained their highest power, and from

Philistine Prisoners.— Sculptures at Medinet Haboo.

the latter received their greatest defeats. In the wars between Assyria and Egypt the country of Philistia was subdued by Tiglath-Pileser (734 B.C.), but the Philistines still intrigued with Egypt, and made various revolts against Sargon and Sennacherib to assert their independence. During the Babylonian captivity they avenged themselves on their old enemies the Israelites (Ezekiel xxv, 15), but subsequently the two nations seem (Nehemiah xiii, 23), to some extent, to have fraternized. The origin of this race has been a question of much debate by Biblical critics.

Phillip (fil'ip), JOHN, painter, one of the greatest colorists of the British school, born at Aberdeen in 1817; died in 1867. After serving his apprenticeship as a house-painter, he received some slight instruction from a local artist, and began to paint portraits. The merit of these induced Lord Panmure to aid him (1836) in going to London, and in attending the schools of the Royal Academy. Two years later he returned to Aberdeen, his pictures at this portion of his career consisting mainly of portraits and subjects from Scottish life. In 1852 and 1856 he visited Spain, and he again returned to that country in 1860. While resident there he was greatly influenced by the works of the Spanish masters, and especially by those of Velasquez. His style completely changed, his subjects became Spanish, and his grasp of color, composition, and character vastly improved. It is his pictures of Spanish life that have made him famous. Among the more important are *Life among the Gipsies at Seville* (1853), *The Letter-writer of Seville* (1854), *Death of the Contrabandista* (1858), *A Spanish Volunteer* (1862), *Agua Bendita* (1863), *Chat Round the Brasero* (1866). In 1860 he painted for Queen Victoria *The Marriage of the Princess*. Many of his works have been engraved.

Phillips (fil'ipz), ADELAIDE, singer, born at Stratford-on-Avon, England, in 1833; died in 1882. She was brought over to Boston at 7 years of age and made that city her permanent home. Her voice was a fine contralto. She made her début at the Boston Museum in 1843 as *Little Pickle*. In 1850 she went to Paris to study, sang in opera in Milan in 1854, and subsequently in New York and elsewhere.

Phillips, DAVID GRAHAM, novelist, born at Madison, Indiana, in 1867. He became an author in 1887 and produced numerous works, beginning with *The Great God Success*. One of the latest was *The Hungry Heart* (1909). He was shot in New York by a lunatic, January 21, 1911.

Phillips, JOHN, geologist, born in 1800; died in 1874. He was instructed in geology by his uncle, William Smith, 'the father of English geology,' and spent many years in arranging museums and organizing scientific societies in Yorkshire towns; became professor of geology in Dublin (1844) and in Oxford (1856). His chief works are a *Guide to Geology* (1834), *Palæozoic Fossils of Cornwall, Devon, and West Somerset* (1841), *Manual of Geology* (1855), and *Life on the Earth* (1861).

Phillips, STEPHEN, English poet, born at Somerton, near Oxford, in 1868. In 1897 his *Poems* were crowned by the Academy. His plays include *Paolo and Francesca* (1899), *Herod* (1900), and *Nero* (1906). D. 1915.

Phillips, THOMAS, an English portrait-painter, born in 1770; died in 1845. In 1792 he exhibited some historical pieces, but soon after turned

his attention to portrait-painting. In 1808 he became a member of the Royal Academy, and in 1824 succeeded Fuseli as professor of painting. He published his *Lectures on the History and Principles of Painting* in 1833.

Phillips, WENDELL, orator and reformer, was born at Boston, Massachusetts, in 1811; died in 1884. He was educated at Harvard College, studied law, and was admitted to the bar in 1834. The persecution of the early abolitionists roused his active sympathy, and in 1837 he eloquently took his stand in favor of the abolition of slavery, being preëminently the orator of the movement. From that date until the Civil war he continued an earnest advocate of the abolition cause, declared that the Constitution was an unrighteous compact between freedom and slavery, and that a dissolution of the Union would be the most effectual mode of giving freedom to the slaves. He was also for many years an advocate of woman suffrage, prohibition, prison reform, and a greenback currency. Collections of his letters and addresses have been published.

Phillipsburg, a town of Warren county, New Jersey, on the Delaware River, opposite Easton, Pa., about 50 miles N. of Philadelphia, and on several railroads. It has extensive iron industries and manufactures of cement, wood, chemicals, silk, etc. Pop. (1910) 13,903; (1920) 16,923.

Philo Judæus (fī'lō jū-dē'us), an Alexandrian Jew of the first century, of whom all that is known is that he belonged to a wealthy family, received a liberal education, and in 40 A. D. visited Rome as one of a deputation to ask the Emperor Caligula to revoke the decree which compelled the Jews to worship his statue. His very numerous writings (which are in Greek) include an account of the Mosaic narrative of the creation, allegorical expositions of other parts of Genesis, lives of Abraham, Joseph, and Moses, treatises on the Decalogue, Circumcision, Monarchy, First-fruits, Offerings, and other subjects.

Philology (fil-ol'ō-ji), or COMPARATIVE PHILOLOGY, a term commonly used as equivalent to the science of language, otherwise called *Linguistic Science*, or *Linguistics*. This science treats of language as a whole, of its nature and origin, etc., and of the different languages of the world in their general features, attempting to classify and arrange them according to such general features, and to settle in what relationship each stands to the others. The philologist as such does not study languages for practical purposes, or to be able to read and speak a number of them, though the more he is tolerably familiar with the better. He rather studies them in the way a naturalist studies a series of animals or plants, as if they were separate organisms each with a life and growth of its own. That every language has such a life and growth is true in a sense, for languages are continually in a state of change; yet a language is not to be regarded as an organism like a plant or an animal, but rather, to quote Professor Whitney, as an *institution*, an outcome of the needs of human beings for communication with their fellows. A language is a system of vocal sounds through which ideas are conveyed from person to person in virtue of the fact that certain ideas are attached or belong to certain sounds by a sort of convention or general understanding existing among those who use the language. That there is any natural law by which one idea belongs to one vocal sound rather than to another can hardly be affirmed in view of the fact that if we select any one idea we shall find that each of the thousand languages of the world expresses this idea by a different sound or group of sounds. Indeed, ideas can be conveyed otherwise than by vocal sounds, as witness the elaborate sign-language that has been developed in some communities, as also the finger-language of the deaf and dumb. We can even conceive that a language of hieroglyphics or written symbols might exist with no spoken language connected with it. We have, however, no knowledge of any such case, and, in fact, wherever man exists we find him making use of speech, which, indeed, is one of his most distinct and marked characteristics. As to the origin of language nothing is really known, although few doubt that it is an invention or acquisition of the human race, and not an original endowment. Any one, however, may believe if he pleases that man was created with a language and the faculty of making use of it already in his possession. If the other view is taken we must suppose that the earliest men had no language to start with, but that having suitable organs for speech they devised a language among themselves as a means of intercommunication, and we may conclude that the earliest attempts at speech were either in imitation of the different sounds heard in nature, or that they were based on the inarticulate utterances or cries by which human beings naturally gave vent to different emotions. But

however language originally arose, it is very certain that whatever language we speak has to be acquired from others who have already learned to speak it, and that those others have similarly acquired it from their predecessors, and so on backwards into the darkness of the remotest ages. Every language is thus at our birth a foreign language to all of us.

The science of philology is quite of modern origin, being hardly, if at all, older than the 19th century. Speculations on language and its nature were indulged in by the ancient Greeks; but as the Greeks knew little or nothing of any language but their own, they had not sufficient materials wherewith to construct a science of language. In later times materials became more abundant as scholars studied Hebrew, Greek, Latin, Arabic, etc.; but it was the introduction of Sanskrit to the western world, and its observed similarity in many respects to Greek that led to the establishment of philology on a true scientific basis, an achievement which was largely due to the labors of Bopp, Pott, Schleicher, and other German scholars. Yet though most valuable results have been obtained and a large number of languages have been studied and classified, much remains to be done, much remains uncertain and must always remain so. One great difficulty that the philologist has to grapple with is the want of historical documents to throw light on the history of the great majority of languages, as only a very few possess a literature dating from before the Christian era, and far the greater number have no literature at all..

To begin with our own language and its kindred tongues. Philology has succeeded in showing that the English language is one of a group of closely allied languages which are known by the general name of the Teutonic or Germanic tongues. The other languages of the group, some of which are more closely connected with English than the rest, are Dutch, German, Danish, Icelandic or Old Norse, Swedish, and Gothic, to which may be added, as of less importance and having more the character of dialects, Norwegian, Frisian, the Plattdeutsch or Low German of Northern Germany, and Flemish, which differs little from Dutch. The Teutonic tongues are often divided into three sections, based on closeness of relationship: the *High German*, of which the modern classical German is the representative; the *Low German*, including English, Dutch, Frisian, Plattdeutsch, and Gothic; and the *Scandinavian*, including Danish, Swedish, and Icelandic. Another division is into: *East Germanic*, including Gothic and Scandinavian, and *West Germanic*, including the others.

The evidence that all these languages are closely akin is to be found in the great number of words that they possess in common, in the similarity of their structure, their inflections, their manner of compounding words — in short, in their family likeness. This likeness can only be accounted for by supposing that these languages are all descended from one common language, the primitive Teutonic, which must have been spoken at a remote period by the ancestors of the present Teutonic peoples, there being then only one Teutonic people as well as one Teutonic tongue. In their earliest form, therefore, and when they began to be differentiated, these languages must have had the character of mere dialects, and it is only in so far as each has had a history and literature of its own that they have attained the rank of independent languages.

The rise of dialects is a well-known phenomenon, taking its origin in the perpetual change to which all languages are subject. A language that comes to be spoken over a considerable area and by a considerable number of persons — more especially when not yet to some extent fixed by writing and literature — is sure to develop dialects, and each of these may in course of time become unintelligible to the persons using the others, if the respective speakers have little intercourse with each other, being separated by mountain ranges, arms of the sea, or merely by distance. In this way is the existence of the different Teutonic tongues to be accounted for. A similar instance of several languages arising from one is seen in the case of Italian, French, Spanish, and Portuguese, all of which are descended from the Latin. Of the common origin of these we have, of course, direct and abundant evidence.

The Teutonic tongues, with the primitive or parent Teutonic from which they are descended, have been proved by the investigations of philologists to belong to a wider group or family of tongues, which has received the name of the Aryan, Indo-European, or (especially in Germany) Indo-Germanic family. The chief members of this family are the Teutonic, Slavonic (Polish, Russian, Bohemian), Lithuanian, Celtic (Welsh, Irish, Gaelic, etc.), Latin (or Italic), Greek (or Hellenic), Armenian, Persian, and Sanskrit. Just as the Teutonic tongues are believed to be the offspring of one parent Teutonic tongue, so this

parent Teutonic and the other members of the Aryan family are all believed to be descended from one primitive language, the Aryan or Indo-European parent-speech. The people who spoke this primeval Aryan language, the ancestors (linguistically at least) of the Aryan races of Europe and Asia, are believed by many to have had their seat in Central Asia to the eastward of the southern extremity of the Caspian Sea. This, however, is very problematical, and some philologists see reason to think that Europe may rather have been the original home of the Aryans. The latter view is now perhaps the one most generally held.

How remote the period may have been when the ancestors of the Teutons, the Celts, the Slavs, the Greeks, Romans, Persians, and Hindus were living together and speaking a common language is uncertain. Yet the general character of their language is approximately known, and philologists tell us with some confidence what consonant and what vowel sounds the Aryan parent-speech must have possessed, what were the forms of its inflections, and what, at the least, must have been the extent of its vocabulary, judging from the words that can still be traced as forming a common possession of the sister tongues of the family.

In order to understand how it is that many words in the different Aryan tongues are really of the same origin, though superficially they may appear very different, it is necessary to know something of *Grimm's Law*. This law, which, like a natural law, is simply a statement of observed facts, is so named from the great German philologist who first definitely laid it down as the result of observation and comparison of the relative linguistic phenomena. It concerns the so-called 'mute' consonants (*t*, *d*, *th*; *k*, *g*, *h* (*ch*); *p*, *b*, *f*), and takes effect more especially when these are initial. According to it, in words and roots that form a common possession of the Aryan tongues, being inherited by them from the parent-speech, where in English (more especially Anglo-Saxon) and in most of the Teutonic tongues we find *t*, *d*, or *th*, we find in Latin, Greek, and Sanskrit not these letters, but respectively *d* instead of *t*, an aspirated sound instead of *d*, and *t* instead of *th*. That is, an English *t* corresponds to a Latin, Greek, and Sanskrit *d*, as is seen in *tame;* compared with L. *domare*, Gr. *damaein*, Skr. *dam*, to tame; an English *d* corresponds to Latin *f*, Greek *th*, Sanskrit *dh*, as in E. *door*, L. *fores*, Gr. *thyra*, Skr. *dvāra* (for original *dhvāra*), a door; an English *th* corresponds to Latin, Greek, and Sanskrit *t*, as in *thin*, compared with L. *tenuis*, Gr. *tanaos*, Skr. *tanu*, from root *tan*, to stretch. If we next take the gutturals we find that English *k* (or *c* hard), *g*, *h*, correspond respectively in the above languages to *g*, *h* (*ch*, *gh*), *k*, as is seen in E. *kin*, L. *genus*, Gr. *genos*, Skr. *janas* (where *j* is for original *g*); E. *goose* (modified from original *gans*), compared with L. *anser* (for older *hanser*), Gr. *chēn*, Skr. *hansa;* E. *head* (A. Sax. *heafod*), L. *caput*, Gr. *kephalē*, Skr. *kapāla*. Similarly *b* in English corresponds to *f* in Latin, *ph* in Greek, and *bh* in Sanskrit, as in *brother* = L. *frater*, Gr. *phratēr*, Skr. *bhratri*, a brother; *f* in English to *p* in Latin, Greek, and Sanskrit, as in *father* = L. *pater*, Gr. *patēr*, Skr. *pitri*, father. German exhibits certain letter-changes peculiar to itself, and for this reason is placed, in any full statement of Grimm's law, apart from the other Teutonic tongues. In German, for instance, *t* takes the place of an English *d*, as in G. *tag*, E. *day*, G. *teil*, E. *deal;* *d* the place of *th*, as in G. *ding*, E. *thing*, G. *drei*, E. *three*, etc. In some cases the law does not operate in consequence of the influence of other letters; thus the *s* of *stand* prevents the *t* from becoming *th*, as it ought to do to represent the *t* of L. *stare*, to stand. Certain other exceptions to the law are accounted for by a subsidiary law of more recent discovery than Grimm's law, known as *Verner's Law*, and formulating certain facts connected with the original accentuation of Aryan words.

The Aryan tongues, ancient and modern, are entitled to claim the first rank among the languages of the globe, both for richness, harmony, and variety, and more especially as embodying a series of literatures to which no other family of tongues can show a parallel. Next in importance come the *Semitic* tongues — Hebrew, Chaldee, Syriac, Arabic, etc. These, like the Aryan tongues, form a well-marked family, one notable peculiarity of which is the possession of 'triliteral' roots, or roots of which three consonants form the basis and give the general meaning, while inflection or modification of meaning is indicated by internal vowel-change. Thus the vowels play a subordinate part to the consonants, and do not, as in the Aryan tongues, associate with them on equal terms. Other important linguistic families are the *Hamitic*, which includes the ancient Egyptian, the Coptic, Berber, Galla, Somali, etc.; the *Turanian* or *Ural-Altaic*, which includes Turkish, Finnish,

Hungarian, Mongolian, etc.; and the *South-Eastern Asiatic*, which includes Chinese, Siamese, etc. The Turanian languages belong to the type known as *agglutinate* or *agglutinating*, being so called from the fact that the root always maintains a sort of independence or distinctive existence, the other elements of the word being more or less loosely 'glued' or stuck on, as it were. The Chinese is the chief of the *monosyllabic* languages, so called from their words consisting normally of monosyllables. Other families of languages are the Malayo-Polynesian of the Indian Archipelago and Pacific; the Bântu, a great family of S. Africa; and the American Indian languages, the latter characterized as *polysynthetic*, from the way in which they crowd as many ideas as possible into one unwieldy expression. All these families form groups, so far as is known, separate from and independent of each other; and attempts to connect any two of them, as Aryan and Semitic for instance, have met with little success. Formerly etymologists had no hesitation in deriving English words from Hebrew roots, but this was in the days when there was no science of comparative philology. That all languages are descendants of one original tongue, as is believed by many, linguistic science can neither affirm nor deny, though the evidence does not sustain it. We may add that community of language is not a proof of community of race, since it is well known that, as the result of war or otherwise, races have given up the language that once belonged to them and adopted some other.

Philomela (fil-o-mē'la), in mythology, a daughter of Pandion, king of Athens, who being violated and deprived of her tongue by Tereus, the husband of her sister Progne, made known her wrong to the latter by embroidering it in tapestry. In revenge the sisters murdered Itys, the son of Progne by Tereus, and served him up to his father. Tereus pursued them, but they were changed by the gods into birds, Philomela and Progne into a nightingale and a swallow, and Tereus into a lapwing.

Philopœmen (fil-o-pē'men), an ancient Greek patriot and commander, born at Megalopolis, in Arcadia, about B. C. 252. Having distinguished himself in war against the Spartans, he was, in 208 B. C., appointed commander-in-chief of the forces of the Achæan League. He reorganized the Achæan army, defeated and slew with his own hand Machanidas, tyrant of Sparta, and subsequently defeated Nabis. the successor of Machanidas. He induced the Spartans to join the Achæan League; but, soon becoming dissatisfied, they separated from the confederacy, and called in the Romans to their assistance. Philopœmen, as commander of the Achæans, declared war against Sparta, and, having taken the city, treated it with the greatest severity. The Romans, however, interfered, and Sparta was again admitted into the confederacy as an independent state. Messene now revolted, and Philopœmen, though broken by infirmity and disease, drove back the insurgents, but was afterwards taken prisoner, carried in chains to Messene, and compelled to drink poison, B. C. 183.

Philosopher's Stone. See *Alchemy.*

Philosophy (fil-os'u-fi; Greek, *philosophia*, love of wisdom), a term first brought into general use by Socrates. Philosophy is the science that deals with the general principles which form the basis of the other sciences, and of which they themselves take no cognizance. It follows up the data of experience to their ultimate grounds, regarding each particular fact in relation only to a final principle, and as a determinate link in the system of knowledge. In this view philosophy may be defined as the science of principles.

For all practical purposes the history of philosophy may be treated as commencing with the Greeks, the philosophic notions of the inhabitants of the East being considered merely as introductory to the Greek philosophy, in which many oriental notions were incorporated. The first problem of Greek philosophy was to explain the enigma of external nature, to solve the problem not of the soul but of the world. Thales (about 600 B. C.) stands at the head of the Ionian school, which, with the Eleatic school, was the chief representative of speculative thought in pre-Socratic times; the former of these schools being characterized by Aristotle as seeking to find a material, the latter a formal principle of all things. The material principle sought by the Ionian school was assumed to be water by Thales, a primitive infinite but undetermined matter by Anaximander, and air by Anaximenes. The Pythagoreans, abstracting from the quantitative rather than the qualitative character of matter, substituted a symbolic principle — number — for the sensuous principle; but the Eleatics, transcending alike the sensuous principle of the Ionics and the quantitative principle of the Pythagoreans, conceived of pure being as the one sole substance, the phenomenal world being

viewed as unreal. The three great philosophers of this school are Xenophanes, its founder, Parmenides, and Zeno. The transition from abstract to concrete being, from the Eleatic principle of unity to the world of phenomena, was attempted by Heraclitus (about 520 B. C.), who asserted for an absolute principle the unity of being and non-being — becoming. According to him all things are in constant flux, the product of conflicting opposites, of the One at once warring and harmonizing with itself. Empedocles (440 B. C), in attempting to solve the reason of this flux, advanced the theory that matter was the principle of permanent being, while force was the principle of movement. The two moving forces in his system were love and hate. According to the Atomists, on the other hand, who are represented by Leucippus and Democritus (450 B. C.), the moving forces became an unintelligible necessity giving form to the world. Anaxagoras (born about 500) asserted reason as the principle, and though he did not develop his theory to any extent, the mere expression of a spiritual principle is sufficient to mark it as forming an era in philosophy. In the hands of the Sophists this principle, in the sense of individual reason, became the occasion of their denial of all objective reality. In Socrates (470–399 B. C), who united scientific method and a high ethical and religious spirit, the destructive teaching of the Sophists found its keenest opponent. What are called the minor Socratic schools — the Cynics, Cyrenaics, and Megarians — severally professed to regard Socrates as their founder, the Cynics, however, defining the end of action as self-sufficiency, the Cyrenaics as pleasure, and the Megarians as reason. With Plato (430–347) philosophy lost its one-sided character. Though professedly a disciple of Socrates his system of idealism is his own. The Platonic idea is the pure archetypal essence, which is the source of all the finite realities that correspond to it. The visible world is an inferior reproduction of the world of pure ideas, where shine in all their splendor the good, the true, and the beautiful. In logic Plato brings back science to general ideas. In ethics the highest end of man is regarded as the unity of his nature. Plato's ideal theory is criticized by Aristotle, because he gives no real explanation of the connection between the phenomenal and the ideal. In Aristotle's own system, instead of beginning with the general and the absolute, as Plato had done, he begins with the particular and individual. His whole philosophy is a description of the given and empirical; and his method is induction. His system presents us with a number of coördinate sciences, each having its independent foundation, but no highest science which should comprehend them all. The three schools of Greek philosophy which followed the systems of Plato and Aristotle, and which mark the declining days of Greece, are those of the Stoics, Epicureans, and Skeptics. Rome had no philosophy properly its own; the universal character of Roman philosophizing was eclecticism, of which Cicero was the most illustrious representative. In Alexandria eastern and western philosophy, as also Judaism, Christianity, and Paganism, came into contact. Neo-Platonism, founded by Ammonius Saccas (A. D. 193), strove to combine, in opposition to Christianity, the chief elements of classical and eastern speculation. Hellenic ideas were mingled with a vague symbolism, and with theories of ecstasy and divine union. Christianity, in the apologists of the 2d century and the Alexandrine fathers, related itself very early to the philosophy of the time, but not until about the 11th century did there begin to manifest itself a distinctive Christian philosophy in scholasticism, which, assuming the dogmas of the church to be absolutely true, sought to justify them to the reason in abundant tomes of opposite opinions of little philosophical importance.

Modern philosophy, which begins with the 15th century, is characterized by a freer, more independent spirit of inquiry. First the scholastic philosophy was attacked by those who called to mind the ancient Greek philosophy in its original purity. After this struggle new views were presented. Bacon and Locke on the one hand, and Descartes on the other, stand respectively at the head of the two systems — empiricism and idealism, which begin modern philosophy. Bacon created no definite system of philosophy, but gave a new direction to thought, the empiricism which he founded finally developing into skepticism. The system of Descartes was opposed by Gassendi, and received modifications at the hands of others, especially Malebranche. The most important successor, however, of Descartes was Spinoza, who reduced the three Cartesian substances to unity, to one infinite original substance, the ground of all things, that excludes from itself all negation or determination, and is named God or nature. Locke (1632–1704), who had a precursor in Hobbes (1588–1679), the influence of whom,

however, chiefly concerned the history of political science, is regarded as the father of modern materialism and empiricism. As occupying the general position of Locke mention may be made of Isaac Newton, Samuel Clarke, William Wollaston, the Earl of Shaftesbury, and Francis Hutcheson. The philosophy of Locke received a further development in France, where Condillac sought to explain the development of humanity by the simple development of the sensations. Then followed the materialism of Helvetius, d'Holbach, La Mettrie, and others, including several of the Encyclopedists. In opposition to this materialistic tendency arose the idealism of Leibnitz and Berkeley. The theories of Leibnitz were systematized by Wolff, and from his time to Kant German philosophy assumed no new standpoint. Berkeley (1684–1753), founding on Locke's principle that we are percipient of nothing but our own perceptions and ideas, argued that the existence of bodies out of a mind perceiving them is impossible, and a contradiction in terms. Granting the premises of Berkeley, his conclusions could not be refuted; but it was reserved for Hume to trace out the ultimate consequences of the Cartesian and Lockian philosophy, and thus, though unintentionally, by a sort of *reductio ad absurdum*, to produce the great metaphysical revolution of which Reid and Kant were the first movers. The Scottish or 'common sense' school of philosophy, with Reid (1710–96) at its head, has the merit of having first strongly inculcated the necessity of admitting certain principles independent of experience, as the indispensable conditions of thought itself. Reid therefore directed his inquiries to an analysis of the various powers and principles of our constitution, in order to discover the fundamental laws of belief which form the groundwork of human knowledge. Dugald Stewart, with some deviations, followed in the track of his master; but Thomas Brown departed on many points of fundamental importance from Reid's philosophy. The same occasion that gave rise to the Scottish school also produced the philosophy of Immanuel Kant. Kant (1724–1804), who may be justly regarded as the father of the philosophy of the 19th century, sought to bring together into unity the one-sided endeavors of his predecessors in the realistic and idealistic schools. He took up a critical standpoint, and from it instituted an inquiry into the origin of our experience or cognition. (See *Kant.*) The ablest opponent of the Kantian philosophy, Jacobi, took the standpoint of faith in opposition to that of criticism, in order to give theoretic certainty to the postulates of the practical reason. In the hands of Fichte the critical idealism of Kant becomes absolutely subjective idealism. 'All that is, is ego'; this is the principle of the Fichtian system; the world is merely phenomenal, consciousness is a phenomenon, perception is a dream. Fichte's subjective idealism found its continuation in the objective idealism of Schelling and the absolute idealism of Hegel, Schelling (1775–1854) started from the ego of Fichte, and by a combination of the doctrine of the ego with Spinozism transformed it into the system of identity. Object and subject, real and ideal, nature and spirit, are identical in the absolute, and this identity we perceive by intellectual intuition. Schelling subsequently, by successively incorporating into his system various opinions from Bruno, Böhme, and others, developed a syncretistic doctrine which constantly approximated to mysticism. Hegel (1770–1831), developed this principle of identity, created the system of absolute idealism. In his philosophy he aims at elevating consciousness to the standpoint of absolute knowledge, and systematically developing the entire contents of this knowledge by means of the dialectical method. Schleiermacher (1768–1834) promulgated an eclecticism to which Plato, Spinoza, Kant, and Shelling were the chief contributors. Schopenhauer (1788-1860) developed a doctrine which may be described as a transitional form from the idealism of Kant to the realism at present prevalent. In opposition to Fichte's subjective idealism, and to Schelling's renewed Spinozism, Herbart (1776–1841) developed a philosophic scheme on the basis of the realistic element in the Kantian philosophy, as also of Eleatic, Platonic, and Leibnitzian doctrines. After the death of Hegel, Feuerbach, Richter, Strauss, Arnold Ruge, and others developed, in an extreme manner, Hegelian thought, and recently Hegelianism has counted more adherents than any other system. Next to it has stood the Herbartian school; and more recently the modification of systems through a return to Aristotle or Kant, and the study of philosophy upon its historic side, have occupied the larger number of minds. While resting in part upon the basis of the doctrines of earlier thinkers, Trendelenburg, Lotze, and others have advanced in new and peculiar paths. In France two philosophical tendencies op-

posed the sensualism and materialism so universal at the beginning of the century. Of these the one was theosophical and the other found expression in the eclectic and spiritualistic school founded by Royer-Collard as the disciple of Reid, and further built up by Cousin, who incorporated into its body of doctrines a number of German philosophical notions. Jouffroy attempted to unite the philosophy of his predecessor Maine de Biran to that of the Scottish school, and became associated with the spiritualistic school, to which also belong the names of Garnier, Janet, Rémusat, Franck, Jules Simon, and others. This school has contended valiantly against the pantheistic tendencies of the age. Independent systems are those of Pierre Leroux, Lamennais, Jean Reynaud, and Buchez. Materialism has its supporters in Cabanis, who sees in thought only a secretion of the brain, Broussais, Gall, and others. Positivism, founded by Auguste Comte, numbers not a few followers.

In Great Britain the Scottish school had later exponents in Sir James Mackintosh (1765–1832) and Sir William Hamilton (1788–1856), the last-named largely influenced in some points of his psychology by Kant. Mansel may be mentioned as a disciple of Hamilton. Ferrier (1808–64) assumed a polemical attitude towards the common-sense school in respect of its fundamental peculiarity, as he viewed it, of absorbing philosophy into psychology, as well as on minor details of the system. The associational psychology of Hartley, Priestley, and Dr. Darwin found representatives in the 19th century in James Mill (1773–1836) and his son John Stuart Mill (1806–73), who make the principle of association the sole explanation of psychical phenomena. Bain, Grote, and Lewes followed more or less in the same track. Herbert Spencer attempted, and with much success, to widen the general principles of science and philosophy into a universal doctrine of evolution. Among the chief leaders of philosophic thought opposed to the English school of empiricism may be mentioned the names of the late T. H. Green, Hutchison Stirling, and Edward Caird. In America, as in England, philosophy has been prosecuted more as an applied science, and in its special relations to morals, politics, and theology. Speculation there has been widely influenced by Scottish philosophy. Among the best-known names of transatlantic philosophical writers are those of Jonathan Edwards, Ralph Waldo Emerson, Henry P. Tappan, Francis Wayland, and others. A modified scholasticism, mostly Thomism, prevails in the Catholic seminaries of France, Spain, and Italy. In most of the continental countries German philosophy has exerted no small influence. In Italy a peculiar philosophical school, represented by Rosmini, Mamiani, and Gioberti, flourished during the 19th century.

Philostratus (fil-os'tra-tus), Flavius, a Greek writer born at Lemuos about the middle of the 2d century of our era. He taught rhetoric at Athens and subsequently at Rome, where he obtained the favor of the emperor Septimius Severus, and he accompanied the empress Julia Domna in her travels. His principal work is his *Life of Apollonius of Tyana*, supposed by some critics to be a parody on the Gospels. His other works are the *Heroica*, a history in dialogue of the heroes of the Trojan war, *Lives of the Sophists*, *Letters*, etc.

Philter (fil'tẽr), a potion supposed to have the power of exciting love. The preparation was frequently associated with magic rites, and the ingredients were frequently of a harmless, fanciful, or disgusting kind. At times, however, poisonous drugs were employed, the death of Lucretius and the madness of Caligula being alike ascribed to philters administered by their wives.

Phlebitis (fle-bī'tis; Greek, *phleps*, *phlebos*, a vein), inflammation of the veins. It may affect any of the veins of the body, but more usually manifests itself in the parts of the veins in the vicinity of wounds. The disease is indicated by great tenderness, tension, acute pain, and a knotted, cord-like swelling or hardness in the course of a vein or veins, sometimes attended, when the veins are superficial, with discoloration. In many instances the inflamed veins secrete pus, and if an artificial issue is not given to it the matter makes its way into the adjoining cellular tissue and forms abscesses, when it is peculiarly dangerous. The causes of the disease are numerous, but usually consist of external injuries of various kinds. Women are peculiarly liable to this disease after parturition.

Phlebotomy (fle-bot'u-mi; Greek, *phleps*, *phlebos*, a vein, and *temnein*, to cut), or Venesection, the act of letting blood by opening a vein; a method of treatment formerly applied to almost all diseases, but now chiefly confined to cases of general or local plethora. Another mode of letting blood is by cupping or by the application of leeches. It has been one of the

processes of the medical profession from the earliest times.

Phlegethon (fleg′e-thon), in the Grecian mythology, a river of fire in the infernal regions.

Phlegmasia (fleg-mā′si-a), PHLEGMON, in medicine, a diffuse inflammation of the subcutaneous connective tissue in which the pus has a tendency to spread itself through the tissues. The name *phlegmasia dolens* is given to what is otherwise known as *milk-leg*, an ailment occurring in women after delivery, and consisting in a very painful swelling of the leg accompanied by fever.

Phlogiston (flu-jis′tun), a name applied, before the time of Lavoisier, to a hypothetical substance supposed to be contained in all combustible bodies, and constituting the source or element of heat.

Phloridzin (flor-id′zin), a glucoside obtained from the root of the apple, pear, cherry, etc. It destroys the malarial parasite and is recommended as an antiperiodic in malaria, but its chief medical use is in testing the functional activity of the kidneys; it producing glycosuria of renal origin, in addition to polyuria.

Phlox (floks), a genus of perennial herbaceous plants of the natural order Polemoniaceæ, natives for the most part of North America, though some of the species are to be met with in Asia. The flowers, which are favorites in gardens, are of a purple or violet color, more rarely white or red, with a salver-shaped corolla, and a narrow sub-cylindrical tube longer than the calyx. The trailing kinds are excellent for rock-work.

Phoca, PHOCIDÆ. See *Seal.*

Phocas (fō′kas), a Greek emperor, born in the 6th century, A. D., of obscure parentage, entered the army in the reign of Mauricius, and rose to be a centurion. At the head of a mutinous army he marched from the Danube to Constantinople, and on the flight of Mauricius took possession of the throne, 602 A. D. The subsequent murder of Mauricius and his family involved him in a war with Persia. He was captured and put to death in 610 by Heraclius the younger and Nicetas, who besieged Constantinople at the head of an expedition fitted out by Heraclius, exarch of Africa.

Phocion (fō′shi-un), an Athenian general, and one of the most virtuous characters of antiquity; supposed to have been born about B. C. 402. In the war with Philip of Macedon the Athenians sent Phocion with some troops to Eubœa, where he obtained a complete victory over the enemy. Some time after he was despatched to assist the cities of the Hellespont against Philip, whom he compelled to retire. According to Plutarch he was nominated commander forty-five times without once applying for the office. He always led a simple life, and cultivated his small farm with his own hands. As the leader of the conservative or aristocratic party he opposed Demosthenes on the question of war with Philip of Macedon, his advice, according to Grote, being eminently mischievous to Athens. He subsequently condemned the confederacy against Alexander the Great, and, after Alexander's death (323 B. C.), the war with Antipater. On each occasion Phocion was employed to make terms with the victorious Macedonians; and though he seems to have used his influence with them to mitigate the burdens upon his country, his conduct readily laid him open to a charge of betrayal. He was accordingly put to death by the popular party in 317 B. C., but his remains were shortly afterwards buried at public expense and his accusers punished.

Phocis (fō′sis; Greek, *Phōkis*), a division of ancient Greece, on the north side of the Gulf of Corinth, between Bœotia on the east and Doris and the Locri Ozolæ on the west. The principal rivers were the Cephissus and Plistus, and the principal mountain Parnassus, on which was situated Delphi with its celebrated oracle. The country is mountainous and unproductive, the valley of the Cephissus being almost the only fertile tract in it. The Phocians were a brave and industrious people, and subsisted chiefly by agriculture. See *Phthiotis.*

Phœbus. See *Apollo.*

Phœnicia (fē-nish′i-â), in ancient geography, a country on the coast of Syria, bounded on the east by Mount Lebanon, and containing the celebrated cities Tyre and Sidon. Phœnicia proper was a tract of country stretching along the eastern shore of the Mediterranean, not much more than 28 miles in length, and little more than 1 mile in average breadth; Sidon being situated near its northern, and Tyre not far from its southern boundary. In a wider sense Phœnicia was regarded as beginning on the north with the Island of Aradus, and extending south to the town of Dora, a little below the promontory of Carmel, being about 120

miles in length, and rarely more than 20 in breadth. It is watered by several streams flowing from Lebanon to the sea, such as the Eleutherus, the Adonis, the Lycus, the Tamyras, the Leontes. The country is fertile in timber, corn, fruits, etc.; and besides the great cities of Sidon and Tyre, it was anciently studded with numerous smaller towns, forming almost an unbroken line along the coast. Among these towns in earlier times were Arvad, Accho, Arka, Tripolis, Berytus, Sarepta, Dora, etc. Many of the roadsteads or harbors were excellent, but are now silted up.

The question as to the original seat of the Phœnicians has received no satisfactory solution; but that, like the Jews, they were Semites by race, is well known. Their immigration to the coast of the Mediterranean belongs to prehistoric times. The settlement of Israel in Canaan did not produce any great or permanent change on Phœnicia. The tribes of Naphtali, Asher, and Dan, to which it was assigned, did not conquer Phœnicia, but occupied only a small portion of it; and the subsequent relations of Israel and Phœnicia were for the most part those of amity, intercourse, and reciprocal advantage. The wealth and power of the Phœnicians arose from their command of the sea, and it was their policy not to provoke any of the nations to the east of them, and not to quarrel unnecessarily with Israel, which was their granary. The relation between Hiram and David was probably but a sample of such international treaties and intercourse. After the division of the Hebrew kingdom Phœnicia would naturally cultivate alliance with the Ten Tribes nearest to it, and Ahab married a Phœnician princess. The country was afterwards successively incorporated in the Assyrian, Babylonian, and Persian empires, but the cities retained more or less their independence. It was next conquered by Alexander the Great, and henceforth simply formed part of Syria.

From a very early period the Phœnicians occupied themselves in distant voyages, and they must speedily have reached to a style of substantial shipbuilding. Xenophon passes a high eulogy on a Phœnician ship; and they were skilled in navigation and the nautical applications of astronomy. Lebanon supplied them with abundance of timber, and Cyprus gave them all necessary naval equipments, from the keel to the top-sails. In the reign of Pharaoh-Necho these daring navigators even circumnavigated Africa, and the Phœnicians furnished Xerxes with 300 ships, which took part in the battle of Salamis. The commerce of Tyre extended widely. It traded in the produce of the whole known world, from the ivory and 'bright iron' and ebony and cotton fabrics of India to the tin from Cornwall and Devonshire. Fishing was also an important industry, and the Tyrians sold fish in Jerusalem. The Phœnicians excelled in the manufacture of the purple dye from the shell-fish *murex*, abundant on its coasts. The glass of Sidon was no less famous than the Tyrian dye. Phœnicia produced also articles of silver and gold as well as of brass; its inhabitants were also skilled in architecture and in mining.

The maritime knowledge and experience of Phœnicia led to the plantation of numerous colonies in Cyprus, Rhodes, and the islands of the Ægean — the Cyclades and Sporades — in Sicily, in Sardinia, the Balearic Islands, and in Spain. The most celebrated of the Phœnician colonies, however, was Carthage, in Northern Africa, which extended its sway over the Spanish peninsula and disputed with Rome the supremacy of the Mediterranean.

As was the case in Canaan at the invasion, each Phœnician city was governed by a king or petty chief. A powerful aristocracy existed in the chief towns, and there were also elective magistrates, called by the Romans *suffētes*, a disguised form of the Hebrew *soffet*. Sidon, and afterwards Tyre, exercised a hegemony over the other states. The relation of Phœnicia to her colonies does not seem to have been very close. Their religion, however, bound the mother country and the colonies in a common worship. Carthage often sent presents to the chief Phœnician god; so did Gades and other settlements.

The religion of the Phœnicians was a species of nature-worship, the objects of adoration being the sun, moon, and five planets; or in another form it was the worship of male and female reproductive powers — the former represented as Baal and the latter as Baalith, Astoreth, or Astarte. The god called Il, a sort of Phœnician Cronos or Saturn, resembling the Moloch or Milcom of the Ammonites, had human sacrifices offered to him. Marine deities must have held a prominent place in their theogony — deities corresponding to the Greek Nereus and Poseidon, which last was worshiped at Berytus. In the oldest temples there were no images, but there were rude fetishes — conical or oblong stones, possibly aerolites 'fallen from heaven,' and fossil belemnites.

While the wealth and commerce of Phœnicia must have brought art and refinement, the people were noted for their dissoluteness. As a people the Phœnicians early obtained a reputation for cunning and faithlessness. They were often pirates; they were certainly slave-traders. They purchased slaves from the northern shores of the Black Sea, and they also kidnaped and sold the children of Israel — a practice which brought upon them the denunciations of the prophets, and a just retaliation was predicted to fall upon them.

The language of ancient Phœnicia was closely akin to Hebrew. The famous passage in the Pœnulus of Plautus illustrates the assertion. Of ninety-four words on a tablet discovered at Marseilles in 1845 relating to the sacrificial ritual no less than seventy-four are found in the Old Testament. Coins and seals also disclose the same affinity, as do the numerous inscriptions. Proper names can all be explained in the same way. The invention of letters is often ascribed to the Phœnicians, being probably derived from the hieroglyphics of Egypt, some of which were alphabetic in significance. The Greeks believed that letters had been brought to them from Phœnicia by Cadmus. The so-called Cadmean letters of the Greek alphabet are A B Γ Δ E F I K L M N O Π P Σ T, the sixth letter F being the *digamma*, which afterwards disappeared from the Greek alphabet. The names of these letters have no meaning in Greek, but they have each a significance in Phœnician or Hebrew. The affinity of the old Greek letters in form to the Phœnician and early Hebrew can be easily traced. The literature of Phœnicia has perished. See also *Tyre*, *Sidon*, *Carthage*, etc.

Phœnicop'terus. See *Flamingo.*

Phœnix (fē'niks), a fabulous Egyptian bird said to have lived for 500 years and then, conscious of approaching death, built a funeral pyre of wood, which it lighted with the fanning of its wings, and rose, from the flames with a new life. It had an eagle's form, with plumage red and golden.

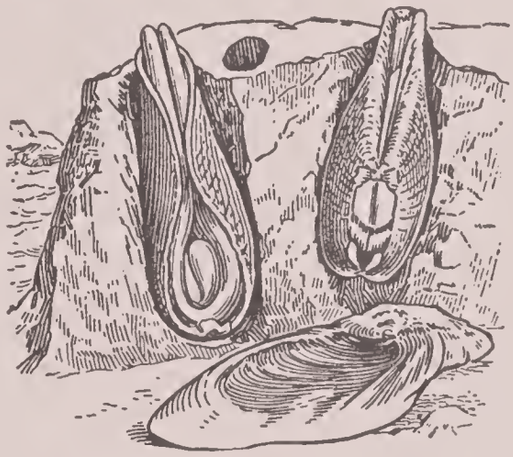
Phœnix, the scientific name of the date-palm genus.

Phœnix, a residential and commercial city of Lee Co., Alabama, on the Chattahooche River, opposite Columbus, Georgia. Pop. (1920) 5432.

Phœnix, the capital of Arizona and county seat of Maricopa Co., the center of the Salt River Irrigation Project, on Santa Fé and other railroads. It has a fine winter climate and is a popular resort. The Long Staple Cotton of Egypt is grown here successfully. Pop. (1910) 11,134; (1920) 29,053.

Phœnixville, a borough of Chester Co., Pennsylvania, on the Schuylkill River at the mouth of French Creek, 28 miles N. W. of Philadelphia. It contains iron works of great extent, among the largest in the United States. They produce steel bridges, architectural and structural iron, rails, boilers, etc. There are also silk-mills and various other industries. Pop. (1910) 10,743; (1920) 10,484.

Pholas (fō'las), a genus of marine Lamellibranchiate bivalves, forming the type of the family Pholadidæ, in which the shell gapes at both ends. The shell, which is of thin white texture, is studded over on its outer surface with numerous rasp-like prominences by means of which the animal excavates, burrows in wood, rocks, indurated clay,

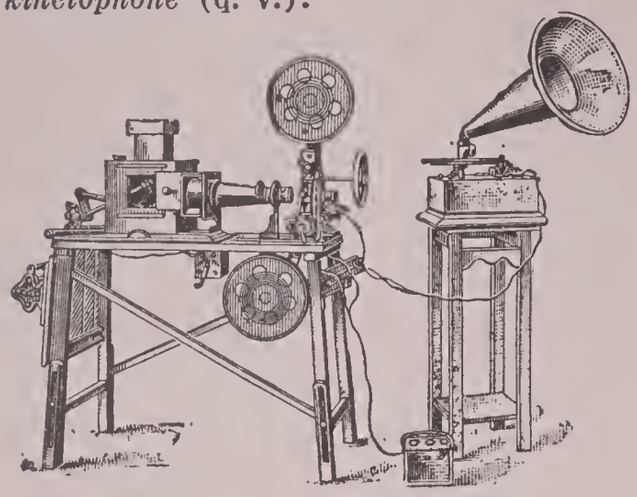


Pholades (*Pholas Dactylus*) in their holes.

etc., maintaining communication with the outer world by means of long breathing-tubes or siphons with fringed edges. They are popularly known as 'piddocks,' and are eaten on many parts of the British coasts. These molluscs appear to possess the power of emitting a phosphorescent light, *P. Dactylus*, the common species, being specially noted on this account.

Phonetics (fō-net'ikz), the science which treats of the various sounds pertaining to human speech, their distinctive characteristics, the voice-mechanism by which they are uttered, and the methods by which they may be best represented to the eye. Any system of writing is strictly phonetic when by it each different sound is represented by a different character, and the same sound always by the same character.

Phonocinematograph (fō-nō-sin-e-mat'o-graf), an instrument which combines sight and sound in motion pictures. Also called *kinetophone* (q. v.).



Phonocinematograph.

Phonograph (fō'nu-graf), an instrument by means of which sounds can be permanently registered, and afterwards reproduced from the register. It consists essentially of a curved tube, one end of which is fitted with a mouthpiece, while the other end (about 2 inches in diameter) is closed in with a disk or diaphragm of exceedingly thin metal. Connected with the center of this diaphragm is a steel point, which, when the sounds are projected on the disk from the mouthpiece, vibrates backwards and forwards. This part of the apparatus is adjusted to a cylinder which rotates on a horizontal axis. On the surface of the cylinder is cut a spiral groove, and on the axis there is a spiral screw of the same pitch, which works in a nut. When the instrument is to be used a piece of tin-foil is gummed around the cylinder, and the steel point is adjusted so as to be just touching the tin-foil, and above the line of the spiral groove. If some words are now spoken through the mouthpiece, and the cylinder kept rotating either by the hand or by clock-work, a series of small indentations are made on the foil by the vibratory movement of the steel point, and each of these markings has an individual character of its own, due to the various sounds addressed to the mouthpiece. The sounds thus registered are reproduced by approaching the diaphragm and its steel point towards the tin-foil at the point where it was when the cylinder originally started, and then once more setting the cylinder in motion. The indentations previously made now cause the steel point to rise or fall or otherwise move as the markings pass under it, and the result is that the diaphragm is thrown into a state of vibration exactly corresponding to the movements induced by the markings, and thus affects the air around so as to produce sounds, and these vibrations being exactly similar to those originally made by the voice, necessarily reproduce these sounds to the ear as the words at first spoken. These marked strips of foil may be posted to any person with whom the speaker wishes to correspond, and who must, of course have a machine similar to that of the sender. The contents of the strips may be reproduced at any length of time, and repeated until the markings become effaced. The tinfoil cylinder type of phonograph was invented by Edison in 1877. In 1885 Chichester A. Bell and Charles Sumner Tainter invented the 'graphophone,' in which a wax instead of a tinfoil cylinder was used. This was the first practical and commercially usable talking machine. In 1887 Emil Berliner, a German, substituted a disc record for the cylinder, calling it a 'gramophone.' The disc machine is the type now in general use for recording music, etc., but the cylinder machines, called 'dictaphones,' are much used in offices as a substitute for stenographers. Records are made on the discs in much the same fashion as on the cylinders. The first record is called the 'master record' and from it is secured a metallic counterpart or shell. This is done by the electro-plating process. When the shell is secured the next step is to provide a matrix which serves as a die or stamp from which to press copies or duplicates of the master record. These copies or duplicates are the talking-machine records which the public ultimately purchases. The matrix or die is placed in a power press, and the records pressed from the material used in making the sound records. This material is prepared in a plastic form so that it can be forced under pressure into every line and indentation on the face of the matrix. The word 'phonograph' is used broadly for all sorts of talking machines.

Phonography (fō-nog'ra-fi), a system of writing by which the sounds of a language are accurately represented. The name is generally applied to Pitman's system of shorthand. See *Shorthand*.

Phonometer (fō-nom'e-tėr), an instrument for ascertaining the number of vibrations of a given sound in a given space of time. Also an instrument for showing the direction of signals, devised in 1915.

Phorminx (for'minks), an ancient Grecian lute or lyre.

Phormium. See *Flax, New Zealand.*

Phosphate (fos'fāt), in chemistry, the generic term for the salts formed by the union of phosphoric anhydride with bases or water or both. They play a leading part in the chemistry of animal and plant life, the most important in this connection being the phosphate of soda, phosphate of lime, and the basic phosphate of magnesia. In agriculture the adequate supply of phosphates to plants in the form of manures becomes a matter of necessity in all deplenished soils. These phosphatic manures consist for the most part of bones, ground bones, mineral phosphates (apatite, phosphorite, coprolites), basic slag, superphosphates and reduced superphosphates (both prepared by treating broken-up bones with vitriol), bone-ash and phosphatic guano. See also *Manures.*

Phosphate-rock, called also marl rock, and bone phosphate. This material has been found in large quantities in South Carolina, and Florida, and ground for sale as a fertilizer. Though mines of this rock are found elsewhere, those named are much the richer. The phosphate-rock belongs to the Eocene formation, though found in post-pliocene basins. It is composed of the remains of fossilized animals, is rich in phosphates and forms an excellent fertilizing material.

Phosphides (fos'fīdz), compounds of phosphorus with one other element, more especially with the metals.

Phosphor-bronze. See *Bronze.*

Phosphorescence (fos-for-es'ens), the property which certain bodies possess of becoming luminous without undergoing obvious combustion. It is sometimes a chemical, sometimes a physical, action. Certain mineral substances exhibit the phenomenon when submitted to insolation, to heat, to friction, to electricity, or to cleavage. Rain, water-spouts, and meteoric dust sometimes present a self-luminous appearance. Several vegetable organisms, chiefly cryptogams, exhibit this kind of luminosity; but the most interesting cases of phosphorescence occur in the animal world, the species in which the luminous property has been observed belonging nearly to every main group of the zoölogical series. In some of the lowest life forms and in many of the jelly-fishes the whole surface of the body is phosphorescent; in other organisms the phosphorescent property is localized in certain organs, as in the sea-pens, certain annelids, the glow-worms, fireflies, etc., while many deep-sea fishes have shining bodies embedded in the skin. The phosphorescence of the sea is produced by the scintillating or phosphorescent light emitted from the bodies of certain microscopical marine animals, and is well seen on the surface of the ocean at night. It is an interesting fact that phosphorescence is a common feature in the deep-sea animals, which dwell in complete darkness except to the extent that they are themselves able to illuminate their place of abode. Phosphorescence in animals appears to be a vital process, consisting essentially in the conversion of nervous force (vital energy) into light; just as the same force can be converted by certain fishes into electricity. See *Fluorescence.*

Phosphoric Acid (fos-for'ik) (PH_3O_4), an acid usually obtained by burning phosphoreted hydrogen in atmospheric air or oxygen. It is also produced by the oxidation of phosphorous acid, by oxidizing phosphorus with nitric acid, by the decomposition of apatite and other native phosphates, and in various other ways. It is used in medicine in the form of solution, constituting the dilute acid of the pharmacopœia. It is peculiarly suited to disordered states of the mucous surfaces, and also to states of debility, characterized by softening of the bones.

Phosphorite (fos'for-īt), a species of calcareous earth; a subspecies of apatite (which see). It is an amorphous phosphate of lime, and is valuable as a fertilizer.

Phosphoroscope (fos-for'o-skōp). an instrument designed to show the phosphorescence of certain bodies that emit light but for a very short period. By its means many substances hitherto unsuspected of phosphorescence have been proved capable of retaining light for very short periods. The name is also given to a philosophical toy for showing phosphorescent substances in the dark.

Phosphorus (fos'fo-rus), a solid, non-metallic, combustible substance ranking as one of the elements; symbol P, atomic weight 31; specific gravity 1.826. It occurs chiefly in combination with oxygen, calcium, and magnesium, in volcanic and other rocks, whose disintegration constitutes very fertile soils. It exists also in the plants used by man as food, and is a

never-failing and important constituent in animal structures. It is manufactured from bones, which consist in part of phosphate of lime, or from native mineral phosphate of lime. Common phosphorus when pure is almost transparent and colorless. At common temperatures it is a soft solid, easily cut with a knife, and the cut surface has a waxy luster; at 108° it fuses, and at 550° is converted into vapor. It is exceedingly inflammable. Exposed to the air at common temperatures it undergoes slow combustion, emits a white vapor of a peculiar, alliaceous odor, appears luminous in the dark, and is gradually consumed. On this account phosphorus should always be kept under water. A very slight degree of heat is sufficient to inflame phosphorus in the open air. Gentle pressure between the fingers, friction, or a temperature not much above its point of fusion, kindles it readily. It burns rapidly even in the air, emitting a splendid white light, and causing intense heat. Its combustion is far more rapid in oxygen gas, and the light far more vivid. The product of the perfect combustion of phosphorus is phosphorus pentoxide or phosphoric anhydride (P_2O_5), a white solid which readily takes up water, passing into phosphoric acid (which see). Compounds of phosphoric anhydride with basic bodies are known as *phosphates* (which see). Phosphorus may be made to combine with most of the metals, forming compounds called *phosphides*. When dissolved in fat oils it forms a solution which is luminous in the dark. It is chiefly used in the preparation of lucifer-matches, and also in the preparation of phosphoric acid. It is of all stimulants the most powerful and diffusible, but on account of its activity highly dangerous. It can be safely administered as a medicine only in extremely minute doses and with the utmost possible caution. Phosphorus presents a good example of allotropy, in that it can be exhibited in at least one other form, known as *red* or *amorphous phosphorus*, presenting completely different properties from common phosphorus. This variety is produced by keeping common phosphorus a long time slightly below the boiling-point. It is a red, hard, brittle substance, not fusible, not poisonous, and not readily inflammable, so that it may be handled with impunity. When heated to the boiling-point it changes back to common phosphorus.

Phosphorus Acid (fos'fo-rus; H_3PO_3), an acid produced by exposing sticks of phosphorus to moist air, and in several other ways. Phosphorous acid exists usually in the form of a thick, uncrystallizable syrup, but it may also be obtained crystallized.

Photius (fō'shi-us), a patriarch of Constantinople, born of patrician parents in that city early in the 9th century. His wealth and interest raised him to the highest offices of the state, whilst he enjoyed the reputation of being the most universally learned and accomplished man of his age. He became secretary of state under the emperor Michael III, and contracted an intimacy with the minister Bardas, uncle of the emperor. On the deposition of the patriarch Ignatius, Bardas persuaded the emperor to raise Photius to the patriarchal dignity. The installation was recognized by the metropolitans of the patriarchate, but was opposed by Pope Nicholas I, whom Photius soon after excommunicated, thereby laying the foundation of the schism between the Eastern and Western churches. But the Emperor Michael having been murdered in 867 by Basil, who was raised to the throne, that prince immediately replaced Ignatius in his office, and banished Photius, who, however, resumed his dignity on the death of Ignatius in 878. On the accession of Leo, son of Basil, to the imperial throne in 886, Photius was again deposed, and banished to a monastery in Armenia, where he died in 891. Photius was an able ecclesiastical statesman, and a man of great intellect, erudition, and literary power. His chief work is the *Myriobiblion*, which may be described as an extensive review of ancient Greek literature. His other works comprise a Greek *Lexicon; Nomocanon*, being a Collection of the Acts of the Councils, to the Seventh Œcumenical, with the corresponding decrees of the Emperors concerning Ecclesiastical Matters; a treatise, *Adversus Latinos de Processione Spiritus Sancti;* and *Amphilochia*, being answers to questions relative to various passages in the Scriptures, with an exposition of the Epistles of St. Paul.

Photochemistry (fō'tō-kem'is-tri), the branch of chemistry which deals with chemical changes produced or influenced by light. That light induces chemical changes was known in the sixteenth century when it was noted by a German chemist that silver chloride turns dark when exposed to light. Among the manifestations of photochemical energy are such well-known effects of sunlight as the formation of chlorophyll (the green coloring matter in

plants), the self-purification of rivers and lakes, the destruction of micro-organisms, the bleaching of different colored substances, etc. Apparently all light rays, from the infra-red to the ultra-violet, are capable of some photochemical activity, but only such rays as are absorbed have any effect. As a general rule, the rays from the violet end of the spectrum, including the ultra-violet ones, have the most powerful chemical effect on colorless substances, although there are exceptions; colored substances are generally acted upon most energetically by rays of their own color. A neutral, unreactive aqueous solution of potassium ferrocyanide, which is quite stable in the dark, is extremely sensitive to light. The most important rays are those of long wave length, such as the bluish-yellow and red of daylight. These bring about the formation of an alkaline aquo base. The reduction of alkali nitrates, on the other hand, is brought about only by light of short-wave lengths, the ultra-violet and violet rays. In sunlight, during the summer, these rays are present in considerable quantities, and the reduction of alkalinitrate to nitrite can be achieved in a short time if the oxygen which is split off is taken care of chemically, a process which may be brought about by addition of complex ferrous salts such as potassium ferrocyanide.

Photo-engraving, a photo-mechanical process of making engravings used for illustrating newspapers, magazines, books, calendars, posters, advertisements and for all printing purposes, in one or many colors. There are several kinds of engravings that come under the heading of photo-engravings, the simplest form being the *line engraving*, which is more often made on zinc, although the better grade is sometimes etched on copper. This engraving is a relief printing plate that is made from pen and ink or stipple drawings, prints, etc., without the use of a screen.

A *halftone engraving* is made by the use of a ruled screen. These screens range from 60 to 200 lines to the inch and are placed between the lens and the photographic plate on which the negative is to be made. The idea is to break up the surface into various sized dots, as the many gradations of color in a drawing or photograph cannot be transferred by any method direct to a sheet of copper and etched. The tones must be changed to either lines or dots so as to make a printing surface for the ink roller of the press to operate on. These dots are of varying sizes, ranging from a minute stipple to a solid black, and they present to the eye the same effect as the unbroken tones of a photograph or drawing.

After this halftone negative is made, it is printed on sensitized copper. The light penetrating the transparent parts of the negative, causes a chemical action to take place on the copper. After the print is made it is developed; the parts on which the light has acted adhere to the metal and the parts that have been protected from the light remain soft and wash away in this development. The plate is then etched in a perchloride of iron solution. After this first etching, it is turned over to the re-etcher, who brings out all the varying tone values of the engraving. This is necessary because it is impossible by the method of making halftone negatives to get highlights and shadows correctly and also retain all the intermediate tones, therefore, the halftone negative is made to carry all the detail, putting in as much highlight as possible.

Color engraving, commonly called *process work*, is based on the theory of the three primary colors, yellow, red and blue. It is assumed that every color is formed by some combination of these three colors. Three negatives are made, one for each color; the red negative is made by placing at the lens a color filter which separates the red rays, whether they appear as pure red or any part of orange or purple, or any of the many tones of which red may form a part. In like manner the yellow and blue plates are made by the use of the filter which acts for these colors in the same manner as that required for the red. After these negatives are made, the same general course is followed as that described for halftone engravings. The re-etcher in this case must be an artist who thoroughly understands color. There are many other forms of photo-engraving, but all are based on the three described.

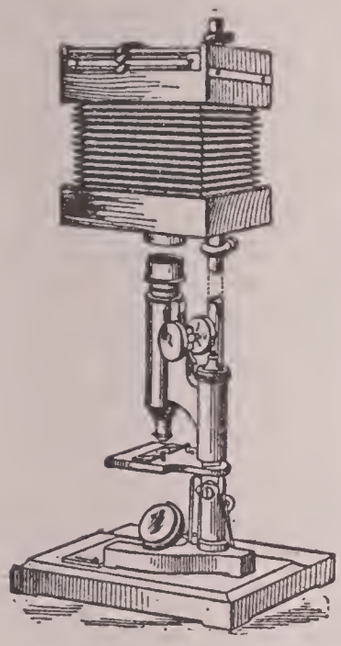
Photography (fō-tog'ra-fi; Greek, *phō, phōtos*, light, and *graphō*, I write) is the art of taking representations of objects by the action of light through the lenses of the camera obscura on a previously prepared surface. It is of comparatively recent origin, though, as early as the commencement of the 19th century, Mr. Thomas Wedgewood had discovered a method of copying paintings on glass and of making profiles by the action of light upon nitrate of

silver. About 1814 M. Nicéphore Niepce, in France, discovered a method of producing, by means of the camera obscura, pictures on plates of metal coated with asphaltum, and at the same time of rendering them permanent. In 1839 Daguerre announced the discovery of the daguerreotype. (See *Daguerreotype Process.*) In the meantime, however, Mr. Henry Fox Talbot had discovered the process of obtaining pictures in the camera by the agency of light on paper coated with chloride and nitrate of silver, and also of fixing them when so obtained. Mr. Talbot gave the name of *calotype* to his process (from *kalos*, fair, and *tupos* or *typos*, an impression), and subsequently introduced various improvements on it, and took out several patents, the earliest being in 1841. It has also been called after him *talbotype*, in the same manner as *daguerreotype* from Daguerre. Numerous modifications of the calotype were introduced, besides various new photographic processes, the most important being those of M. Niepce de St. Victor and Mr. Scott Archer, the former of whom introduced the use of albumen and the latter that of collodion as a substitute for paper, these substances being in either case thinly spread over a plate of glass. Mr. Archer perfected the wet collodion process, and published full working details in 1851. Collodion dry plates were introduced by Dr. Hill Norris in 1856; collodion emulsion dry plates by Messrs. Sayce and Bolton in 1864. In 1871 Dr. R. L. Maddox discovered that glass plates could be coated with an emulsion consisting of bromide of silver contained in gelatine. This gelatine dry-plate process was improved by Bennett in 1878, and came into general use about 1880. It is now almost the only process employed in ordinary photography.

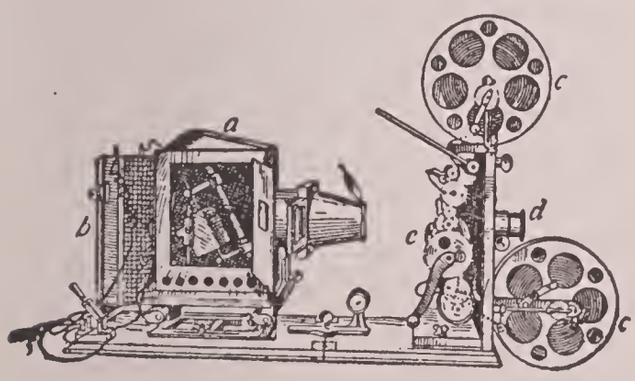
Photographs may be either *negative* or *positive*. *Negative* photographs are produced in the camera, and exhibit the lights and shades contrary to nature, that is, the lights dark and shades white. In order to obtain prints or *positives* several methods are used. In silver printing a paper sensitized by being floated on a solution of albumen mixed with common salt, and then on a solution of nitrate of silver, is placed in close contact with the negative in a printing-frame, and exposed to light until the silver compounds have become sufficiently darkened. It is afterwards toned, fixed, and washed. In the *platinotype* process the paper is sensitized by ferric oxalate and a double salt of potassium and platinum. The latter process requires no toning, and produces a permanent print.

In 1855 M. Poitevin devised a process by which pictures of great beauty and permanence were obtained. He combined carbon or any other pigment, in a fine state of division, with gelatine, starch, or gum, applied it over the surface of his paper, dried it, submitted it to the action of light under a photographic negative, and so first produced what is now usually called a carbon print. In 1864 carbon-printing was brought to a high state of perfection by Mr. Swan, of Newcastle, whose plan was to prepare a solution of gelatine and bichromate of potash (the latter being the sensitizing agent), mixed with some black pigment, and apply the mixture as a coating to a sheet of paper, and print his positives on the black cake, or *tissue* as it is called, thus produced. One of the most important discoveries in connection with photographic printing was that of Mr. Walter Woodbury. By his process the hardened tissue is brought into contact with a plate of type metal under considerable pressure. The plate takes the impression of the relief, and pictures are printed from it instead of from the raised tissue. The autotype process, invented by Mr. Johnson, is a more simple and ready method of carbon-printing than the carbon process proper, but the principles involved are the same. It is used for book illustrations and picture reproduction. Photolithography, the process of reproducing copies of a photograph from a lithographic stone, was discovered by Asser, of Amsterdam, in 1859. Various modes of multiplying photographic pictures by photolithography have been successfully tried. A common mode is to take a print on paper sensitized with gelatine and bichromate of potassium, and to ink it with a suitable oily ink. This ink adheres to the parts where the gelatine has been acted on by light and has become insoluble, but where the gelatine is still soluble the ink can be easily washed off. It is then transferred to a lithographic stone in the usual way. In *photozincography* the process consists in projecting an impression on a plate of prepared zinc by photography and then engraving it by etching with acids, so that copies can be printed from the plate. In 1887 it was announced that Mr. Mayall had discovered the secret of taking photographs in natural colors, and since then much progress has been made in this direction. While colors cannot be directly reproduced, interesting and effective indirect methods have been discovered, and the problem is practically solved. Brilliant photographs of spectra have been produced, and photography has

become a highly important agent in astronomical research, yielding much information not obtainable by eyesight. Since the introduction of the gelatine plate the art of photography has made immense advances, and its applications are endless. Hand (sometimes called *detective*) cameras in all shapes and sizes have been introduced, some of which take pictures of ¼ and ½ plate size. Many improvements have also been made in instantaneous shutters. These are now so carefully adjusted by mechanical appliances that they can be regulated to a small fraction of a second, or a prolonged exposure can be given to any part of the subject at will. These instantaneous processes have enabled scientists to analyze muscular movements and the various modes of locomotion. Remarkable results have also been attained in the application of photography to astronomy, and pictures of the most remote parts of the heavens are now common. The employment of photography in connection with the microscope has been of great assistance in chemistry and biology. Its application in the various processes of book-illustration has also been very successful. Photography by means of artificial light has also been brought to great perfection.



Vertical Photomicrographic Camera.



Moving Picture Machine.

a, arc-lamp; *b*, rheostat; *c*, *c*, film-holders; *d*, objective; *e*, mechanism for moving film and operating shutter.

Photography is now a scientific and fashionable pastime, and men and women amateurs in many cases excel professionals. Photographic societies exist in most large towns, the object being the advancement of photography through the experiments and research of members, who include the leading amateur photographers. A rapid succession of photographs of an event is utilized in the popular moving pictures. When shown rapidly they yield virtually an uninterrupted reproduction.

Photogravure (fō'tu-gra-vūr), a process of engraving in which by the aid of photography subjects are reproduced as plates suited for printing in a copper-plate press. The process known as Heliogravure (which see) is essentially the same.

Photoheliograph (fō-tō-hēl'i-u-graf), an instrument for observing transits of Venus and other solar phenomena, consisting of a telescope mounted for photography on an equatorial stand and moved by suitable clockwork.

Photolithography. See *Photography.*

Photometer (fō-tom'e-tėr), an instrument intended to indicate relative quantities of light, as in a cloudy or bright day, or to enable two light-giving bodies to be compared. Photometers depend on one or other of the two principles, that the eye can distinguish whether two adjacent surfaces are equally illuminated, and whether two contiguous shadows have the same depth. Benson's photometer is based on the former principle, Rumford's on the latter. The common unit for comparison is the light emitted by a sperm-candle burning 120 grains of spermaceti per hour, other lights being said to have the intensity of so many candles. Improved forms of photometers for more easily obtaining the illuminating power produced by coal-gas and the electric light have recently been introduced.

Photophone (fō'tu-fōn), an instrument invented in 1880 by Alexander Graham Bell, which resembles the telephone, except that it transmits sounds by means of a beam of light instead of the connecting wire of the telephone. The success of the instrument depends upon a peculiar property of the rare metal selenium, that, namely, of offering more or less opposition to the passage of electricity according as it is acted upon or not by light. In its simplest form the apparatus consists at the receiving end of a plane mirror of some flexible material (such as silvered mica)

upon which a beam of light is concentrated, and the voice of a speaker directed against the back of this mirror throws the beam of light reflected from its surface into undulations which are received on a parabolic reflector at the other end, and are centered on a sensitive selenium cell in connection with a telephone, which reproduces in articulate speech the undulations set up in the beam of light, by the voice of the speaker.

Photosphere (fō'tu-sfēr), the luminous envelope, supposed to consist of incandescent matter, surrounding the sun. See *Sun*.

Photo-telegraphy (fō-tō-tē-leg'ra-fi). The electric transmission of facsimiles of photographs, drawings, etc.; facsimile telegraphy.

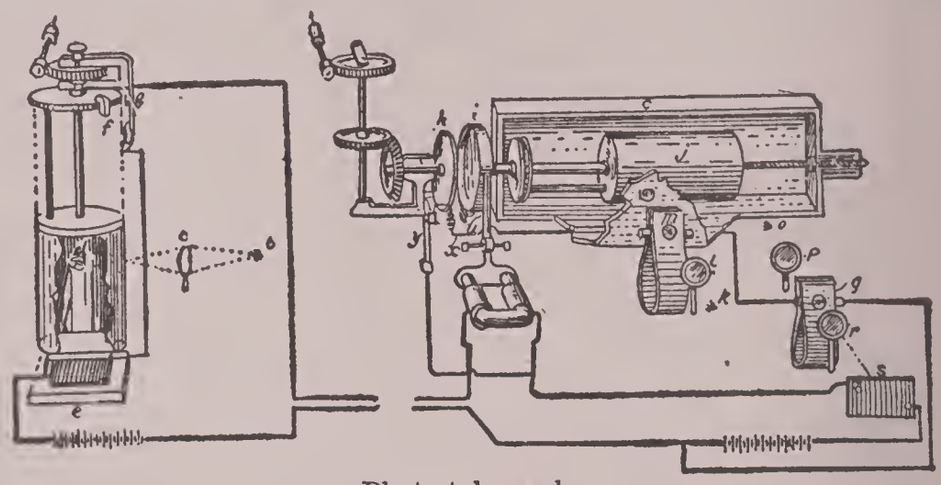


Photo-telegraphy.

Korn's apparatus for transmitting pictures by telegraph, using a selenium cell.

Photozincography. See *Photography*.

Phragmites (frag-mī'tēz), a genus of large grasses widely spread, and usually known as reeds. *P. communis*, the common reed, grows from six to ten feet high, on the borders of lakes and rivers.

Phrenology (fre-nol'ō-ji; Greek, *phrēn*, mind, *logos*, discourse), the term applied to the psychological theories of Gall and Spurzheim, founded upon (1) the discovery that the brain, as the organ of the mind, is not so much a single organ as a complex congeries of organs; and (2) observations as to the existence of a certain correspondence between the aptitudes of the individual and the configuration of his skull. Phrenology may therefore be regarded as a development, partly scientific and partly empirical, of the general idea that a correspondence exists between the physical structure and the psychical and mental traits of every individual man or animal. It was long ago observed by physiologists that in animals a certain character and intelligence seemed to accompany a certain formation and size of skull. Lavater, in his system of physiognomy, went further than this, and gave to particular shapes of the head certain powers and passions: the conical head he terms *religious;* the narrow, retreating front, *weak-minded;* the broad neck, *salacious*, etc. But it was reserved to Drs. Gall and Spurzheim to expand this germ of doctrine into a minute system, and to map out the whole cranium into small sections, each section being the dwelling-place of a certain faculty, propensity, or sentiment. Gall first started this so-called science; but to Spurzheim it is mainly indebted for its systematic arrangement, and to Dr Combe, of Edinburgh, for its advocacy. Gall commenced giving private lectures on the subject in 1796. In 1800 he was joined by Spurzheim, who continued his colleague till 1813, both conducting their researches in common, and traveling together from place to place. At Paris their theories were investigated by a commission of the Institute of France, the result being an unfavorable report drawn up by the celebrated Cuvier. In 1814 Spurzheim came to Britain, where his lectures gained many disciples, among others George Combe, of Edinburgh, one of the best expounders and defenders of phrenology which it can boast. Spurzheim eventually went to America, where he died in 1832.

So far as phrenology was scientific, it undoubtedly was one cause which led to the minute anatomical investigations to which the brain has latterly been subjected; and Gall and Spurzheim have high claims to be regarded as anatomical discoverers and pioneers. Previous to their dissections the brain had generally

been regarded as a single organ rather than a complex congeries of organs. Gall's view of the physiology of the brain was, that the convolutions are distinct nervous centers, each having its own special activity; that the frontal lobes are occupied by the perceptive group of centers; the superior lobes by the moral and æsthetic groups; the inferior lobes by the group mainly concerned in the nutrition and adaptation of the animal to external conditions; and the posterior lobes to the social instincts. To a considerable extent these views have been pronounced to be well founded by later specialists, and thus the leading positions of Gall and Spurzheim have taken a place in scientific psychology as represented by Bain, Carpenter, Ferrier, Wagner, Huschke, and others.

The empirical side of phrenology, sometimes called *craniology*, rests upon the assumption that the relative development of the centers of the brain can be accurately determined by an external examination of the protuberances and depressions of the skull. Craniology is admitted to have a certain degree of foundation in the general truths of physiology, but it cannot pretend to scientific exactness or well-reasoned theory, and in the hands of those who know it best it usually makes no such claim. Its conclusions, like its data, are uncertain and general, because in attempting to delineate a man mentally, morally, and psychically, there are many things other than the external shape of the skull which have to be taken into account, and also many things of essential importance of which it is impossible to take account. For example, the cranium may be small, and yet, owing to the depth of the furrows, the cortex or thinking membrane of the brain may be large; on the other hand, owing to the superficial nature of the furrows, a large cranium may co-exist with a very limited development of cortex. Such a fact as this, it is obvious, is unverifiable in any special instance, except a *post mortem* examination be made.

Phrygia (frij'i-å), in ancient geography a region comprising the western central part of Asia Minor, containing the cities Apamea, Laodicea, and Colossæ. The inhabitants were early civilized, and paid much attention to grazing and tillage. The early history of Phrygia is mythological. Several of its kings are mentioned of the names of Gordius and Midas. On the death of Adrastus (B.C. 560) the royal family of Phrygia became extinct, and the kingdom became a province of Lydia. It afterwards formed a part of the Persian, and still later of the Roman Empire.

Phryne (frī'nē), a famous courtesan of Greece, mistress of Praxiteles, who employed her as a model for his statues of Venus. She offered to rebuild Thebes, if the inscription 'Alexander destroyed this city, and the courtesan Phryne restored it,' be put upon the walls; but the offer was rejected.

Phthiotis (thī-ō'tis), a district of ancient Greece in the south of Thessaly, now forming with Phocis a nomarchy of Greece. Pop. 128,440.

Phthisis (thī'sis). See *Consumption.*

Phycology (fi-kol'u-ji), that department of botany which treats of the algæ or seaweeds.

Phylactery (fi-lak'tèr-i), among the Jews a strip of parchment inscribed with certain texts from the Old Testament, and enclosed within a small leathern case, which was fastened with straps on the forehead just above and between the eyes, and on the left arm near the region of the heart. The four passages inscribed upon the phylactery were Ex., xiii, 1–10, 11–16; Deut., vi, 4–9; xi, 18–21. The custom was founded on a literal interpretation of Ex., xiii, 16; Deut., vi, 8; xi, 18. Phylacteries are the 'prayer-thongs' of the modern Jews. In their origin they were regarded as amulets, which protected the wearer from the power of demons, and hence their name, which is from the Greek *phulassein*, to guard.

Phyllium. See *Leaf-insects.*

Phyllodium (fi-lō'di-um), in botany, the name given to a leaf-stalk when it becomes developed into a flattened expansion like a leaf, as in some Australian species of acacia and certain other plants.

Phyllopoda (fil-op'u-då; 'leaf-footed'), an order of Crustacea possessing numerous feet, numbering eight pairs at least, the first pair being natatory in character. The feet are of foliaceous or leaf-like structure, and are provided with branchial appendages, adapted to subserve the breathing or respiratory function. The carapace, or shelly covering protecting the head and chest, may be well developed, or the body may be destitute of a covering. In their development the Phyllopoda pass through a metamorphosis; and in their earliest state the embryos appear as in the 'nauplius' form (see *Nauplius*). All the Phyllopoda are of small size. The order is represented by

the familiar 'fairy shrimps' (*Chirocephălus*), met with in fresh-water ponds, and the curious 'brine shrimps' (*Artemia*), found in the brine-pans of salt-works, and in the salt lakes of both the Old and New Worlds. The Phyllopoda are of high interest to the palæontologist, on account of the affinities they present to the extinct trilobites (see *Trilobite*). The Phyllopoda themselves are represented as fossils in the Palæozoic rocks.

Phyllostomidæ (fil-os-tom'i-dē), the vampire bats, a family of insectivorous bats. See *Vampire Bat.*

Phylloxera (fil-ok-sē'rà), a genus of plant-lice, family Aphidæ, order Hemiptera. The type of the genus is *Phylloxera quercus*, a species which lives upon oak-trees; but the *Phylloxera vastatrix*, or grape Phylloxera, a species which injuriously affects the vine, has attracted so much attention of late years that it has come to be known as *the* Phylloxera. It presents itself in two types, the one gall-inhabiting (*gallicola*), and the other root-inhabiting (*radicola*). Its proper home is North America, where it was known early in the history of grape culture, and where it doubtless existed on wild vines from time immemorial. It was discovered in England in 1863, and about the same time it made its appearance in France, where it committed great ravages, inflicting immense loss upon the owners of vineyards. Widening its area not only by natural means, but also by commerce in vines and cuttings, it was carried from infected to non-infected districts, and spread to Spain, Portugal, Switzerland, Austria, Prussia, and to all the grape-growing countries of Europe. Only where the soil was of a sandy nature did the vineyards escape. In 1885 its presence was discovered in Australia, at the Cape of Good Hope, and in Algeria; and, generally speaking, it has now obtained a foothold, at least in restricted localities, in every country where the grape-vine is cultivated. Vines attacked by Phylloxera generally show external signs the second year of attack in a sickly yellowish appearance of the foliage and in stunted growth, and the third year they frequently perish, all the finer roots having decayed and wasted away. Many remedies have been proposed, but none is universally practicable or satisfactory.

Phylogeny (fi-loj'e-ni), a term applied to the evolution or genealogical history of a race or tribe. It is used in contrast to ontogeny, which signifies the development or life-history of an individual.

Physalia (fi-sā'li-a), a genus of marine animals of the class Hydrozoa, of the subclass Siphonophora. The *P. Atlantica* is known by the name of the *Portuguese man-of-war.* These hydrozoa are characterized by the presence of one or more large air-sacs, by which they float on the surface of the ocean. Numerous tentacles depend from the under side, one class short and the other long. The shorter are the nutritive individuals of the colony, the longer, which in a Physalia 5 or 6 inches long are capable of being extended to 12 or 18 feet, possess a remarkable stinging power, and are probably used to stun their prey.

Physalia Atlantica (Portuguese man-of-war).

Physeter (fī'se-tir). See *Sperm-whale.*

Physical Geography embraces the branch of geography which treats of the surface of the earth, or of any part of it as regards its natural features and conformation, the changes that are constantly taking place and that have formerly taken place so as to produce the features now existing; it points out the natural divisions of the earth into land and water, continents, islands, rivers, seas, oceans, etc.; treating of the external configuration of mountains, valleys, coasts, etc.; and of the relation and peculiarities of different portions of the water area, including currents, wave-action, depth of the sea, salt and fresh water lakes, the drainage of countries, etc. The atmosphere in its larger features is also considered, including the questions of climate, winds, storms, rainfall, and meteorology generally. Finally it takes up various questions connected with the organic life of the globe, more especially the distribution of animals and plants, and their relation to their environment; tracing the influence of climate, soil, natural barriers or channels of communication, etc., upon the growth and spread of plants and animals, including in the latter the various races of man. The field of physical geography is thus by no means easy to confine within strict limits, as it is so closely connected at various points with geology, mineralogy, botany and zoölogy, chemistry, ethnology, etc. The term Physical

geography is often replaced by Physiography (which see).

Physicians, ROYAL COLLEGE OF (LONDON), a body which owes its origin to the exertions of Thomas Linacre, one of the physicians of Henry VIII, who, through the influence of Cardinal Wolsey, obtained in 1518 from that monarch letters patent incorporating himself with certain other physicians named, and all other men of the same faculty in London, as one body. Various privileges were accorded to them, the chief of which was that of prohibiting any one from practicing as a physician in London, or within a circuit of 7 miles round it, unless he had first obtained a license from this corporation. A charter granted four years later confirmed the privileges of the body, except that graduates of Oxford and Cambridge were permitted to practice within the jurisdiction of the college without previously being examined by it. Various charters have been granted to the body subsequently, but since the passing of the Medical Act of 1858, the license of the college is not necessary to those practicing in London or within 7 miles round.

Physick (fis'ik), PHILIP SING, surgeon, was born at Philadelphia, Pennsylvania, in 1768. He was graduated at the University of Pennsylvania in 1785 and in 1791 was licensed by the Royal College of Surgeons in London. In 1805 he became Professor of Surgery in the University of Pennsylvania; in 1825 was elected member of the French Academy of Medicine, and in 1836 honorary fellow of the Royal Medical and Chirurgical Society of London. One of his most brilliant operations was that of enterotomy on Chief-Justice Marshall, which resulted in the removal of over 1000 calculi and a perfect cure. He introduced numerous valuable instruments and improved modifications of others, and applied novel methods of treatment. His skill brought him the title of the 'father of American surgery.' He died in 1837.

Physic-nut, the seed of the *Curcas purgans* (*Jatrŏpha purgans*), or the plant itself, a shrub belonging to the natural order Euphorbiaceæ, a native of intertropical countries, principally the East and West Indies. The seeds have acquired the name in virtue of their strong emetic and purgative properties, due to a fixed oil which resides principally in the embryo. This oil is expressed and used in medicine under the name of *Jatropha-oil*, for the same purposes as croton-oil, although it is less powerful. The name of French or Spanish physic-nuts is given to the seeds of another member of the same genus, the *Curcas multifidus*, a native of the same regions. The oil expressed from it is called Oil of Pinhoen, and is similar in its properties to Jatropha-oil.

Physics (from Greek, *physis*, nature), or NATURAL PHILOSOPHY, is the study of the phenomena of the material world, or of the laws and properties of matter; more restrictedly it treats of the properties of bodies as bodies, and of the phenomena produced by the action of the various forces on matter in the mass. It thus has as its chief branches the subjects dynamics, hydrostatics, heat, light, sound, electricity, and magnetism. (See the different articles.)

Physiognomy (fiz-i-og'nu-mi), the doctrine which teaches the means of judging of character from the countenance. Aristotle is the first who is known to have made any attempts in physiognomy. He observed that each animal has a special predominant instinct; as the fox cunning, the wolf ferocity, and so forth, and he thence concluded that men whose features resemble those of certain animals will have similar qualities to those animals. Baptista della Porta, in his work *De Humana Physiognomia* (1586), revived this theory and carried it out further. The theory was adopted and illustrated by the French painter Lebrun, in the next century, and by Tischbein, a German painter of the 18th century. The physiologist Camper sought new data in a comparison of the heads of different types of the human species, and in attempting to deduce the degree of intelligence belonging to each type from the size of the facial angle. Lavater was the first to develop an elaborate system of physiognomy, the scope of which he enlarged so as to include all the relations between the physical and moral nature of man. (See *Lavater.*) It is a subject of great interest, but one must be on his guard against a general application of the rules which experience seems to have furnished him.

Physiography (fiz-i-og'ra-fi), a term often used as equivalent to physical geography (which see); but otherwise used to embrace the aggregate of information necessary to be acquired as a preliminary to the thorough study of physical geography, or as an introduction to the study of nature and its forces.

Physiologus, same as Bestiary. See *Bestiaires.*

Physiology (fiz-i-ol'ō-ji), in medical and biological science, the department of inquiry which

investigates the *functions* of living beings. In its wide sense the living functions of both animals and plants come within the scope of physiology, this division of the subject being comprehended under the terms *comparative physiology* and *animal* and *vegetable physiology*. When more specially applied to the investigation of the functions in man the appellation *human physiology* is applied to the science. The importance of physiological inquiry in connection with the observation of diseased conditions cannot be overrated. The knowledge of healthy functions is absolutely necessary for the perfect understanding of diseased conditions; and the science of *pathology*, dealing with the causes and progress of diseases, may in this way be said to arise from, and to depend upon, physiological inquiry. Physiology in itself thus forms a link connecting together the various branches of natural history or biology and those sciences which are more specially included within a medical curriculum. The history of scientific physiology may be said to begin with Aristotle (384–322 B.C.), who attained no mean knowledge of the subject. The Alexandrian school, flourishing about 280 B.C. under the Ptolemies, and represented by Erasistratus, Herophilus, and others, obtained greater opportunities for the acquirement of physiological knowledge through the investigation of the bodies of criminals who had been executed. Erasistratus thus threw much light on the nervous system and its physiology; whilst Herophilus made important observations on the pulse, and in addition discovered the lacteal or absorbent vessels and the depression in the back of the skull formed by the blood sinuses of the brain and called the torcular Herophili, or 'winepress of Herophilus.'

After this there was a period of decline, but Galen, living in the 2d century after Christ, again raised the science to a respectable position, and effected a vast advance and improvement in physiological knowledge. The systems which succeeded Galen and his times consisted, until about 1543, of absurd speculations and theories, conducive in no respect to the advance of true knowledge. In 1543 Vesalius paved the way towards the more scientific epochs of modern times by his investigations into the anatomy and structure of the human frame. In 1619 Harvey, the 'father of modern physiology,' discovered the circulation of the blood. Since this time the history of physiology has gone hand in hand with the general history of anatomy (which see). One noteworthy peculiarity of modern physiological research consists in the introduction and extensive use of the experimental mode of investigation in physiology; and of elaborate and delicate instruments and apparatus, such as the sphygmograph, or pulse-recorder; the ophthalmoscope; the laryngoscope; and the microscope. The different departments of physiology may be enumerated as comprehending the investigation of the three great functions which every living being performs, namely (1) *nutrition*, including all that pertains to digestion, the circulation, and respiration; (2) *innervation*, comprising the functions performed by the nervous system; (3) *reproduction*, which ensures the continuation of the species and includes also the phenomena of *development*. See the articles *Digestion*, *Respiration*, *Skin*, *Eye*, *Ear*, *Larynx*, *Tongue*, etc.

Phytolacca (fī-to-lak'ka), a genus of tropical or subtropical herbaceous plants, type of the nat. order *Phytolaccaceæ*. One species is the American pokeweed (which see).

Phytopathology (fī-tō-pa-thol'ō-ji) or PLANT PATHOLOGY, the science of the diseases of plants, comprising knowledge of the symptoms, course, causes and remedies of the maladies which threaten the life of plants or which result in undesirable abnormalities. In its systematized form, as a branch of botanical study, it is of comparatively recent date. The subject first received special attention about 1850, though references to blights and mildews occur in the Bible and other early literature. Phytopathology covers several branches of study: (1) The observation and description of symptoms (*Diagnosis*); (2) the study of causes of disease (*Aetiology*); (3) the practice of preventive or curative measures (*Therapeutics*).

Piacenza (pē-ä-chen'tsä, anc. *Placentia*), a town of North Italy, capital of a province of same name, nearly equidistant from Parma and Milan, at the confluence of the Trebbia with the Po. Being a place of strategic importance, it has long been fortified, and is still surrounded by walls with bastions and fosse, outside which are a series of detached forts. The principal edifices are the cathedral, in the Lombard-Romanesque style (mostly built between 1122 and 1233) and other churches; the town-house, of the 13th century, one of the finest structures of its kind; and the Palazzo Farnese (now used as barracks). Piacenza is an important railway center with manufactures. It was originally a Roman colony and was founded in 218 B.C. Between 997 and 1035 it was governed by its bishops. In 1447 it was

captured and sacked by Francesco Sforza; and in 1545 it was united with Parma to form an hereditary duchy for Pierluigi Farnese, son of Pope Paul III Pop. 39,658.—The province belongs to the basin of the Po, and is generally fertile; area, 965 sq. miles; pop. 245,126.

Pia Mater (pī'a mā'tėr), one of the membranes investing the brain. See *Brain.*

Piana dei Greci (pē-ä'nå de-i-grā'-chē), a town in Sicily, in the province and 10 miles s. s. w. of the city of Palermo. Pop. 8285.

Piano (pi-an'ō; Italian), soft, low; used in music in contradistinction to *forte. Pianissimo*, the superlative of *piano.*

Pianoforte (pi-an'u-for-te), or PIANO, a musical stringed instrument, the strings of which are extended over bridges rising on the sounding-board, and are made to vibrate by means of small felted *hammers*, which are put in motion by *keys*, and where a continued sound is not intended to be produced have their sound deadened immediately after the touch of the keys by means of leathern *dampers.* Its name is compounded of two Italian words signifying soft and strong, and it was so called in contradistinction to the harpsichord, the instrument which it superseded, and which did not permit of the strength of the notes being increased and diminished at will. The mechanism by which the movement of the keys is conveyed to the strings is called the *action*, and there is no part of the pianoforte in which the variations are more numerous. There are usually three strings in the pianoforte for each note in the higher and middle octaves, two in the lower, and one in the lowest notes. The strings are of steel wire. The lowest notes have their strings wound round with a double coil of brass wire, and those next above with a single coil. Pianofortes are either in the form of the grand piano, in which the strings lie in the direction of the keys, or they have the strings stretched vertically perpendicular to the keys, which is now the most common form, and constitutes the upright piano. Recently a variety called the upright grand has also been introduced. Grand pianos are used as concert instruments, and have the greatest compass and strength. The common compass of the piano at present is six and seven-eighths or seven octaves. The invention of the pianoforte can scarcely be ascribed to any one man in particular. The first satisfactory hammer-action appears to have been invented by an Italian of Padua, named Bartolommeo Cristofali, about 1711. Among the principal improvers of the pianoforte are Sebastian Erard, the founder of the Erard firm; and Roller et Blanchet.

Piano Players, the name given to devices attached to or built into pianos, consisting of perforated rolls which pass over slots through which air is admitted, operating mechanical fingers that strike the keys with whatever tempo or tone is desired. Air is supplied by bellows operated either by the feet or by electricity. Expression marks are indicated on the rolls, often by famous players.

Piarists (pī'a-rists), a Catholic order devoted to the education of the poor; founded in 1621.

Piassaba (pi-as-sa'ba), or PIASSA'VA, a strong vegetable fiber imported from Brazil, and largely used for making brooms. It is chiefly obtained from palms such as *Attalēa funifĕra* and *Leopoldinia piassāba.* The fiber proceeds from the decaying leaves, the petioles of which separate at the base into long, coarse, pendulous fringes. It was first utilized in England, and the consumption is now large. Other European countries also consume considerable quantities.

Piastre (pi-ås'tr), a name first applied to a Spanish coin, which, about the middle of the 16th century, obtained almost universal currency. The Spanish piastre had in later years the value of about 96 cents. The Turkish piastre, originally worth about 84 cents, has now declined in value to about 4 cents in Turkey and 5 cents in Egypt.

Piatra (pyå'trå), a town in Roumania, on the Bistritsa, 53 miles southwest of Jassy. It carries on a large trade in grain and timber. Pop. 17,391.

Piatt (pī'at), JOHN JAMES, poet, born at Milton, Indiana, in 1835. He engaged in journalism, became clerk of the United States Treasury and of the House of Representatives, and was consul at Cork, Ireland, 1882–94. He published *Poems by Two Friends* (with W. D. Howells), *Poems of Heart and Home*, and other volumes of verse.—SARAH M. B. PIATT, his wife, born in Kentucky in 1836, was also a poet of merit, and published *A Woman's Poems*, *A Voyage to the Fortunate Isles*, etc.

Piauhi (pē-ou-ē'), or PIAUHY, a province of Brazil, bounded by the Atlantic and the provinces of Ceará, Pernambuco, Bahia, and Maranhao, from which latter it is separated by the Parnahyba; area, 116,523 square miles. Its

coast-line is not above 10 miles in length. The soil, generally composed of alluvium, is of great natural fertility; but there is very little agriculture. The rearing of cattle, esteemed the best in Brazil, constitutes the principal source of wealth. Capital, Therezina; port, Parnahyba. Pop. 334,328.

Piazza (pi-az′a; Italian), in architecture, is a square or other open space surrounded by buildings. The term is frequently, but improperly, used to signify an arcaded or colonnaded walk.

Piazza-Armeri′na, a town of Italy, in Sicily, province of Caltanissetta, and 18 miles E. S. E. of the town of Caltanissetta, said to have been founded by Greeks from Platæa. Pop. (1910) 32,070.

Piazzi, GIUSEPPE, an Italian astronomer, born in 1746; died in 1826. In 1780 he became professor of mathematics at Palermo, where he promoted the establishment of an observatory and compiled his *Catalogue of the Stars.* January 1, 1801, he discovered the planet or asteroid Ceres, which opened the way for the discovery of so many others.

Pibroch (pē′bro*h*), a wild, irregular species of music peculiar to the Highlands of Scotland. It is performed on a bagpipe, and adapted to excite or assuage passion, and particularly to arouse a martial spirit among troops going to battle. The pibroch produces by imitative sounds the different phases of a battle — the march, the conflict, the flight, the pursuit, and the lament for the fallen.

Pica (pī′ka), the name of a standard size of type. See *Printing.*

Pica, the generic name of the magpies.

Pica, a depraved form of appetite. See *Appetite.*

Picard (pi-kär), JEAN, a French astronomer, born in 1620; died in 1682. In 1655 he became Gassendi's successor in the chair of astronomy in the Royal College of France. The measurement of an arc of the meridian is the work by which Picard is now chiefly known — a measurement historically important in the science of astronomy, as it furnished Newton with the means of verifying his theory of gravitation.

Picard, LOUIS BENOÎT, a French writer of comedies, born in 1769; died in 1828. Before he was quite eighteen he became an actor, and almost as early he began to write for the stage, his first play being *Le Badinage Dangereux* (1789). On account of his skilful delineation of character, he was called by the French *Le petit Molière.* He was the author of more than seventy larger and smaller pieces, besides several romances.

Picardy (pik′ar-di), formerly a province of France, in the northern part of the kingdom, lying between the British Channel, Normandy, and Artois, now divided among the departments of Pas-de-Calais, Somme, Aisne, Oise, and Nord. The capital was Amiens.

Piccini (pit-chē′nē), NICCOLO, an Italian musical composer, born in 1728; died in 1800. He composed comic and serious operas, chiefly for the stages of Rome and Naples, with such success that for many years he was without a rival in Italy. In 1776 he accepted an invitation, on very favorable terms, from the French court, and went to Paris, where he engaged in the famous musical contest with Gluck. (See *Gluck.*) In his later years he fell into misfortunes. He wrote over 150 operas, besides numerous oratorios and cantatas.

Piccolo (pik′u-lō; Italian, *little*), a small flute having the same compass as the ordinary flute, but pitched an octave higher.

Piccolomini (pik-u-lom′i-ni), a distinguished Siennese family, still flourishing in Italy in two branches. The two most celebrated members are: — 1. ÆNEAS SYLVIUS BARTHOLOMÆUS, afterwards Pope Pius II. (See *Pope Pius II.*) — 2. OCTAVIO, a grand-nephew of the first, born in 1599; died in Vienna in 1656. He served in the armies of the German emperor, and became one of the distinguished generals in the Thirty Years' war. He was a favorite of Wallenstein, who entrusted him with a knowledge of his projects, when he purposed to attack the emperor. In spite of this he made himself the chief instrument of Wallenstein's overthrow, and after the latter's assassination (1634) was rewarded with a portion of his estates. He is one of the principal characters in Schiller's drama of *Wallenstein,* to the second part of which he gives the title. His son Max, who appears in the same play, is an invention of the poet's.

Pice (pīs), a small East Indian coin, value about ¼ cent.

Pichegru (pēsh-grü), CHARLES, a French general, born at Arbois, department of Jura, in 1761. He was for some time a tutor at the College of Brienne, but soon exchanged this profession for that of a soldier. After the outbreak of the French Revolution he rose rapidly; was commander-in-chief of the army of the Rhine in 1793, and of the army of the north in 1794; subjugated Holland, and entered Amsterdam in January, 1795. Pichegru

was now at the height of his fame, and was honored by the convention with the title of savior of his country; but, disgusted with the anarchical state of affairs then prevailing in the capital, he entered into negotiations with the Bourbons, and became the soul of the party hostile to the Revolution. Having been proscribed in consequence of the events of the 18th Fructidor (September 4, 1797), he was transported to Cayenne, but the year following escaped to England, where he entered into a conspiracy with George Cadoudal to assassinate Napoleon. Having gone to Paris for this purpose, he was captured by the police, and committed to the Temple prison, where he was found strangled April 6, 1804.

Picher, a city of Ottawa Co., Oklahoma, in the N. E. corner of the State, near the Kansas and Missouri borders. It has extensive mining interests. Pop. (1920) 9676.

Pichincha (pē-chēn'chȧ), a volcano of Ecuador, in the Andes near Quito; height, 15,900 feet.

Picidæ (pī'si-dē), the woodpecker family, so named from the chief genus *Picus.* See *Woodpecker.*

Pickerel (pik'ėr-el), the young of the fish known as the pike. In the United States the name is given to some of the smaller kinds of pike.

Pickering (pik'ėr-ing), a market town of England, in North Riding of Yorkshire, 32 miles northeast of York. It is a town of great antiquity. Its castle was the prison of Richard II in 1399. Pop. 3674.

Pickering, Timothy, statesman, born at Salem, Massachusetts, in 1745; died in 1829. He took part in the battle of Lexington, served in the Continental army as adjutant-general and as quartermaster of the army, and after the war united with Patrick Henry and Alexander Hamilton in opposing the measure that drove the Tories into exile. He negotiated a treaty with the Iroquois Indians in 1791, was appointed Postmaster-general in Washington's cabinet and later was Secretary of State, serving under Washington and Adams. He was elected to the Senate in 1804, and from that time continued actively in politics.— John Pickering, his son (1777–1845), philologist, held many important positions, was president of the American Academy of Arts and Sciences, and a number of other learned societies, and published many pamphlets on philological and other subjects.— Charles Pickering, his grandson (1805–78), physician and ethnologist, wrote *The Races of Men and their Geographical Distribution, Chronological History of Plants,* etc.— Edward Charles Pickering, his great-grandson, born at Boston in 1846, was graduated at Harvard in 1865, became professor of astronomy and geodesy at Harvard, and was director of its observatory after 1876. He made the study of the light and spectra of stars special features of his work and established an auxiliary station at Arequipa, Peru, for the observation of southern stars. He is a member of many learned societies, and author of *Elements of Physical Manipulation* and many volumes of Harvard Observatory annals.— William Harry Pickering, brother of the preceding, born at Boston in 1858, also became an astronomer, and was appointed assistant professor of the Harvard Observatory. He conducted several expeditions to observe several solar eclipses, and had the honor of discovering two new satellites of Saturn, Phœbe, the ninth, and Themis, the tenth. He established astronomical stations in Arizona and Jamaica, and has been an expert in mountain climbing, ascending more than 100 peaks. He is the author of a number of astronomical and other works.

Pickles (pik'elz), vegetables and certain fruits first steeped in strong brine, and then preserved in close vessels. Wood vinegar is often used, but malt or wine vinegar produces the best pickles. Owing to the corroding effects of brine and vinegar, the use of metallic vessels should be avoided in making pickles. To give a green color to pickles verdigris or other poisonous compounds of copper are sometimes employed by manufacturers.

Pickett, George Edward, soldier, born at Richmond, Virginia, in 1825; died in 1875. He graduated at West Point in 1846, served in the Mexican war, and in 1861 joined the Confederate army as brigadier-general, being made major-general in 1862. He took a prominent part in the main battles in Virginia, and led his division in the famous 'Pickett's charge' at Gettysburg.

Pico (pē'kō), one of the Azores, consisting of a single volcanic mountain, which terminates in a peak (El Pico) 7613 feet high, that emits smoke and lava. It is fertile and well wooded, and produces an excellent wine, of which 25,000 pipes are exported annually. Area, 254 sq. miles; pop. about 130,000.

Pico della Mirandola. See *Mirandola.*

Picotee'. See *Carnation.*

Picquet. See *Piquet.*

Picric Acid. See *Carbazotic Acid.*

Picton (pik'tun), Sir Thomas, a British general, born in Pembrokeshire in 1758; entered the army in 1771, and, after serving in the West Indies, rose to the rank of colonel, and became governor of Trinidad in 1797. His next service was the capture of Flushing, of which he was appointed governor in 1809. He afterwards distinguished himself in the Peninsular war at Badajoz, Vittoria, Ciudad Rodrigo, etc. He was killed at Waterloo, 1815.

Picton, a port of entry and capital of Prince Edward's county, Ontario, Canada, 40 miles s. s. w. of Kingston. It has canning and packing industries. Pop. 3698.

Pictou, a commercial town and seaport in the northern part of Nova Scotia, on a safe and commodious harbor. Bituminous coal is mined and largely exported, and a beautiful sandstone is quarried. Pop. 3235.

Picts (piktz), the name given to the ancient Caledonians, who inhabited North Britain till the beginning of the sixth century, usually regarded as a Celtic race, though some consider them to have been not even Aryans, but Turanians. See *Scotland.*

Picts' Houses. See *Earth Houses.*

Picul (pik'ul), in China, a weight of 133⅓ lbs. It is divided into 100 catties or 1600 taels.

Picus (pī'kus), an old sylvan deity in Italy, who was represented with the head of a woodpecker (Latin, *picus*), and presided over divination. This is also the scientific name of a genus of woodpeckers.

Piddock. See *Pholas.*

Piedecuesta (pi-ā-de-kụ-es'tȧ), a town of the republic of Colombia, on the Rio de Oro, with a university. In a coffee, sugar, and tobacco region. Pop. about 12,000.

Piedmont (pēd'mont; Italian, *Piemonte*), a department or territorial division of Italy, between Switzerland, Lombardy, Liguria, and France; area, 11,340 square miles; pop. 3,407,493. It forms the upper valley of the river Po, and derives its name, signifying 'foot of the mountain,' from its situation at the base of the loftiest ranges of the Alps, by which it is enclosed on all sides except towards the Lombard plain. It forms one of the most beautiful and fertile portions of Europe, commencing on the north, south, and west in majestic mountains, and thence descending in magnificent terraces and finely undulating slopes to the rich plains of the Po, to the basin of which it all belongs. It is divided into four provinces — Turin, Alessandria, Cuneo, and Novara. The chief town in Turin. See *Sardinia* (*Kingdom of*), *Savoy* (*House of*), and *Italy.*

Pier (pēr; Fr. *pierre*, a stone), in architecture, is the name applied to a mass of masonry between openings in a wall, such as doors, windows, etc. The solid support from which an arch springs or which sustains a tower is also called a pier. The term is also applied to a mole or jetty carried out into the sea, intended to serve as an embankment to protect vessels from the open sea, and to form a harbor.

Pierce (pērs), Franklin, fourteenth President of the United States, was born at Hillsborough, New Hampshire, in 1804; died in 1869. He graduated at Bowdoin College, studied law, and began practice in 1827. He was elected to Congress by the Democratic party in 1833 and served in the House till 1837, when he was elected as a member of the Senate. He resigned in 1842, and in 1846–47 served in the Mexican war as a brigadier-general. He was nominated for the Presidency in 1852 and was elected by a very large majority of electoral votes. His influence was used in favor of the proslavery party, and in 1863 he spoke against the coercion of the seceded states.

Pierian (pī-ē'ri-an), an epithet given to the Pierides or Muses, from the district of Pieria in Thessaly, which was sacred to them.

Pierre, Bernardin de Saint. See *Saint-Pierre.*

Pierre (pi-ār), St., a small island near the southern coast of Newfoundland, forming with the adjacent island of Miquelon a colony of France. The inhabitants subsist entirely by the cod-fisheries and the industries connected with them. The Islands of St. Pierre and Miquelon were first acquired by the French in 1763; and were finally confirmed to them at the general Peace of 1814.

Pierre, a city, capital of South Dakota and county seat of Hughes Co., is situated on the Missouri River, opposite Fort Pierre. It is the seat of a government industrial school for Indians and is the leading live-stock center of the state. It is an active business point for central Dakota and the Black Hills region. Pop. 3656.

Pierre (pi-ār), St., a town in the West Indies, capital of the Island of Martinique, on the northwest

coast. It had fine churches, a botanical garden, and was well fortified, but was totally destroyed, with its 30,000 inhabitants, by an eruption of Mt. Pelee, May 8, 1902.

Pierrefonds (pi-ār-foṇ), a village of France, dep. Oise, near Compiegne, remarkable for its castle, founded in 1390 and recently restored. Pop. 1800.

Pierre-les-Calais, St. See *Calais.*

Pierrot (pi-er-rō), a comic character on the French stage, dressed like a harlequin, and playing the part of a cunning but cowardly rogue.

Pierrepont (pēr'pont), Edwards, statesman, was born at North Haven, Connecticut, in 1817; died in 1892. He studied law and became eminent in his profession, was made a judge of the Superior Court of New York in 1857, and attorney-general of the United States in 1875. In 1876 he was appointed United States Minister to Great Britain.

Piers Plowman. See *Langlande.*

Pietà (pē-ā-tà'), in painting and sculpture, a representation of the Virgin embracing the dead Christ. In St. Peter's at Rome is a Pietà by Michael Angelo.

Pietermaritzburg (pē-tėr-mår'-itz-burg), capital of Natal, 45 miles inland from Durban, with which it is connected by a railway. It was founded in 1843, and named after two of the Boer leaders, Pieter Retief and Gertz Maritz. It is regularly built, with wide streets planted with trees, contains the governor's residence and government buildings, etc. Pop. (1911) 30,555.

Pietism (pī'e-tizm), in German theology the religious views of the *pietists*, a name originally applied in derision to some young teachers of theology at Leipzig, who began in 1689 to deliver ascetic lectures on the New Testament to the students and citizens. The idea of imparting theological instruction in a popular way came from their friend and teacher Spener (the German Fénelon), who had held religious meetings in Frankfort from the year 1670, at which the laity prayed, and were allowed to ask questions, etc. The Leipzig lectures were put a stop to as being hostile to good government, but the influence of the pietists led to the foundation (1695) of the University of Halle, which became the center of evangelical religion in Germany. The leading adherents of Spener were appointed its first professors, among them Francke, the founder of the celebrated Waisenhaus or orphanage at Halle. The pietists were noted for their preference of practical as opposed to doctrinal religion, but they never formed a separate sect. The Jansenism and Quietism of France and the Methodism of England sprang from sources similar to those of the German pietism.

Pietra-dura (pi-ā'tra dö'ra), a kind of mosaic executed in Italy, and especially at Florence, in hard stones, such as topazes, garnets, carnelians, rubies, etc.

Piezometer (pī-e-zom'e-tėr), an instrument for measuring the compression of water and other liquids under pressure. In Oersted's piezometer the pressure is gauged by the manometer, and the amount of compression indicated by mercury in a glass tube.

Pig. See *Hog.*

Pigafetta (pē-ga-fet'a), Antonio, born at Vicenza towards the end of the 15th century, accompanied Magellan in the first circumnavigation of the globe (1519–22). He kept a journal of the voyage, of which a complete edition was first published only in 1800.

Pigeon (pij'un), the common name of a group of birds, forming in some systems a section of the order of rasorial or gallinaceous birds, in others a distinct order. The pigeons or doves as a group have the upper mandible arched towards its apex, and of horny consistence; a second curve exists at its base, where there is a cartilaginous plate or piece through which the nostrils pass. The crop is of large size. The pigeons are generally strong on the wing. They are mostly arboreal in habits, perching upon trees, and building their nests in elevated situations. Both sexes incubate; and these birds generally pair for life; the loss or death of a mate being in many cases apparently mourned and grieved over, and the survivor frequently refusing to be consoled by another mate. The song consists of the well-known plaintive *cooing*. The pigeons are distributed in every quarter of the globe, but attain the greatest luxuriance of plumage in warm and tropical regions. The pigeon family is divided into various groups. The true pigeons or Columbidæ are represented by the stock-dove, the common wild pigeon, from which, it was once supposed, most of the beautiful varieties of the *Columbidæ*, which in a state of domestication are dependent upon man, derived their origin; but it is now believed the rock-dove is the parent stock. The passenger-pigeon was formerly very

abundant in North America. The numbers that sometimes moved together were vast beyond conception. Millions of these pigeons associated together in a single roost. They were, however, destroyed by hunters so indiscriminately that they have entirely disappeared. The house-pigeons, tumblers, fantails, pouters, carriers, and jacobins are the chief varieties of the rock-pigeon, and have been employed by Darwin (see his *Origin of Species* and his *Animals under Domestication*) to illustrate many of the points involved in his theory of 'descent by natural selection.' Other species of pigeons are the *Treronidæ* or fruit-pigeons of India, the Eastern Archipelago, and Australia; the *Gouridæ* or ground-pigeons, the largest of the group, including the crowned pigeon (*Goura coronāta*) of the Eastern Archipelago. See also *Carrier Pigeon, Turtle-dove,* etc.

Pigeon-berry. Same as *Pokeweed.*

Pigeon English, conjectured to be a form of 'business English,' a conglomeration of English and Portuguese words wrapped in a Chinese idiom, used by English and American residents in China in their intercourse with the native traders.

Pigeon-pea, the fruit of the leguminous shrub *Cajanus Indicus*, a native of India, but now cultivated in tropical Africa and America. In India the pigeon-pea forms a pulse of general use. Called also *Angola Pea* and *Congo Pea.*

Pig-iron. See *Iron.*

Pigment-cell, in physiology, a small cell containing coloring matter, as in the choroid coat of the eye.

Pigments (pig'mentz), materials used for imparting color, especially in painting, but also in dyeing or otherwise. The coloring substances used as paints are partly artificial and partly natural productions. They are derived principally from the mineral kingdom; and even when animal or vegetable substances are used for coloring they are nearly always united with a mineral substance (an earth or an oxide). In painting the colors are ground, and applied by means of some liquid, which dries up without changing them. The difference of the vehicle used with the method of employing it has given rise to the modes of painting in water-colors, oil-colors, in fresco, in distemper, etc. For oil-painting mineral substances are more suitable than *lakes* prepared with minerals, because the latter become darker by being mixed with oil. The *lake* colors have tin or alum for their basis, and owe their tint to animal or vegetable coloring substances. Indigo is a purely vegetable color, as is also blue-black, which is obtained from burned vine-twigs. Ivory black is a purely animal color, being nothing else than burned ivory. In staining porcelain and glass the metallic colors which are not driven off by heat and are not easily changeable are used.

Pigmy. See *Pygmy.*

Pignerol. See *Pinerolo.*

Pignut. See *Earthnut.*

Pika (pī'ka), the calling-hare (*Lagomys*), an animal nearly allied to the hares, and forming the family Lagomydæ. It is found in Russia, Siberia, and North America, and is remarkable for the manner in which it stores up its winter provision, and also for its voice, the tone of which so much resembles that of a quail as to be often mistaken for it.

Pike (pīk), a genus of fishes belonging to the order Teleostei, and included in the Malacopterous division of the order. The pikes form the types of the family Esocidæ, in which group the body is lengthened, flattened on the back, and tapering abruptly towards the tail. One dorsal fin exists, this structure being placed far back on the body, and opposite the anal fin. The lower jaw projects. Teeth are present in plentiful array, and are borne by almost every bone entering into the composition of the mouth. The common pike (*Esox lucius*) occurs in the rivers of Europe and North America. It is fished chiefly for the sake of its flesh, which is accounted exceedingly wholesome. The pikes are very long-lived, and form the tyrants of their sphere, being the most voracious of fresh-water fishes. When fully grown the pike may attain a length of 5 or 6 feet, and there are numerous instances on record in which these fishes have greatly exceeded that length. The sea pikes (*Esox belŏne*), also known as garpikes, are also included in the family Esocidæ. (See *Garfish.*) The saury pike (*Scombresox saurus*) resembles the garpike in general conformation, but possesses the dorsal and anal fins in the shape of a number of divided 'finlets.' The bony pike (*Lepidosteus osseus*) of North American lakes and rivers belongs to an entirely different order of fishes — that of the Ganoidei. See *Bony Pike.*

Pike, a sort of lance, a weapon much used in the middle ages as an

arm for infantry. It was from 16 to 18 feet long, and consisted of a pole with an iron point. For some time every company in the armies of Europe consisted of at least two-thirds pikemen and one-third harquebusiers. Gustavus Adolphus omitted the pikemen in some regiments entirely. The invention of the bayonet drove the pike out of use.

Pike, ALBERT, poet, was born at Boston, Massachusetts, in 1809; died in 1891. He settled in Arkansas, became a lawyer, and was attorney for the Cherokee Indians. He served in the army during the Mexican war, and organized some Indian regiments during the Civil war, leading them in the battle of Pea Ridge and Elkhorn. After the war he was for a time editor of the Memphis *Appeal*. In 1839 he published *Hymns of the Gods*, and subsequently other poems. He also wrote works on Masonry.

Pike, ZEBULON MONTGOMERY, soldier and explorer, born at Lamberton, New Jersey, in 1779. He entered the army, and in 1805 led an expedition sent by the government to trace the Mississippi to its source, and subsequently made expeditions in the West, discovering Pike's Peak, and reaching the Rio Grande. He was appointed brigadier-general in 1813, and on April 13 of that year was killed during an attack on York (now Toronto) in Canada.

Pike-perch (*Lucioperca*), a genus of fishes closely allied to the perch, but showing a resemblance to the pike in its elongated body and head. Like the pike, it is a dangerous enemy to other fresh-water fishes, but the flavor of its flesh is excellent. In Europe it occurs in two species. It also occurs in the fresh waters of the United States, such as the great lakes, the Upper Mississippi, and the Ohio.

Pike's Peak, one of the highest summits of the Rocky Mountains (14,134 feet), in the center of the state of Colorado. It was discovered by General Z. M. Pike in 1806. It abounds in rich gold-bearing quartz, and has a meteorological observatory. A rackrail line of railway, 9 miles long, to top of mountain, is operated during the summer months.

Pikul. See *Picul*.

Pilaster (pi-las'tėr), a square pillar projecting from a pier or a wall to the extent of from one-fourth to one-third of its breadth. Pilasters originated in Grecian architecture. In Roman they were sometimes tapered like columns and finished with capitals modeled after the order with which they were used. See *Column*.

Pilaster—Corinthian.

Pilate (pī'lat), PONTIUS, the sixth Roman procurator of Judæa. He succeeded Valerius Gratus in A.D. 26. Nothing is known of his early history. He was a narrow-minded and impolitic governor, and at the very beginning of his term of office led to commotions among the Jews at Jerusalem. When Christ had been condemned to death by the Jewish priests, who had no power of inflicting capital punishments, he was carried by them to Pilate to be executed. Yielding to the clamors of the Jews the Roman governor ordered Jesus to be executed, but permitted Joseph of Arimathea to take his body and bury it. Pilate was afterwards removed from his office by Vitellius, prefect of Syria (A.D. 36), and, according to tradition, was banished by Caligula to Vienna (Vienne), in Gaul, where he is said to have died or committed suicide some years after.

Pilatus (pē-lä'tös), MOUNT, a mountain in Switzerland, on the borders of the cantons of Lucerne and Unterwalden. Its loftiest peak, the Tomlishorn, attains a height of 7116 feet. It is almost as great a favorite with mountain climbers as the Rigi on account of the imposing views of the Bernese mountain scenery obtained from various points. A railway to the summit was opened in 1889.

Pilchard (pil'chard; *Clupea pilchardus*), a species of fishes included in the family and genus of the herrings (Clupeidæ), which they much resemble, though rather smaller. The usual spawning time is October. They are found in greatest plenty on the southern coasts of England, the Cornwall pilchard fisheries being those best known and most celebrated. Pilchards are chiefly consumed in Spain, Italy, and France during Lent and other fasting seasons. Many of the commercial 'sardines' are in reality young pilchards, the sardine (which see) being also included in the herring genus.

Pilcomayo (pēl-kō-mä'yō), a river in South America, which rises in Bolivia, on the eastern declivities of the Andes, and falls into the

Paraguay, near Asuncion, after forming the boundary between Paraguay and the Argentine Republic. Its entire length is between 1500 and 1600 miles. On account of its shallowness during the dry season and the great current in its narrow parts it does not appear likely to become usefully navigable.

Piles. See *Hemorrhoids.*

Piles (pīlz), in works of engineering, are used either for temporary purposes or to form a basis for permanent structures. In the former case they are usually squared logs of wood sharpened at the point, which is sometimes protected with an iron shoe to enable it to penetrate the harder strata which it may meet with in being driven into the ground. The most usual purpose to which piles are applied in temporary structures is to make cofferdams. The permanent purposes for which piles are employed are various. In many cases the object is to secure a firm foundation in a loose or swampy soil. In these cases the piles used are now often of cast-iron, sometimes solid and sometimes hollow. Piles are driven in by a heavy block raised and let fall alternately, this in extensive works being accomplished by means of steam machinery.

Pilewort. See *Celandine.*

Pilgrimage of Grace, an insurrectionary movement in the north of England, in 1536–37, subsequent upon the proceedings of Henry VIII in regard to the church. The insurgents demanded the fall of Cromwell, redress to the church, and reunion with Rome. Mustering to the number of 30,000, they marched upon York, and within a few days were masters of England north of the Humber. Henry temporized, promising a free parliament at York; but when the insurgents returned home all concessions were revoked, and a renewal of the revolt was suppressed with great rigor. Many perished by the block, the gibbet, and the stake.

Pilgrimage (pil'gri-mij), a journey to a sacred place. The practice of making pilgrimages to places of peculiar sanctity is as ancient as it is widespread. The ancient Egyptians and Syrians had privileged temples, to which worshipers came from distant parts. The chief temples of Greece and Asia Minor swarmed with strangers. But it is in Christianity and Mohammedanism that the practice has attained its greatest development. The first Christian pilgrimages were made to the graves of the martyrs. By the end of the fourth and beginning of the fifth century the custom had become so general as to lead to abuses. Throughout the middle ages, and especially about the year 1000, the religious fervor of the people manifested itself in numerous pilgrimages, especially to Jerusalem. The outrages inflicted on the Christian pilgrims by the Saracens led to the Crusades, which were themselves nothing else than gigantic armed pilgrimages. The shrine of Our Lady of Loretto, near Rome, that of St. James of Compostella in Spain, of St. Martin of Tours in France, were all sacred spots to which, from the tenth to the thirteenth century, and even much later, pilgrims resorted in innumerable crowds; and from the end of the twelfth century the shrine of St. Thomas A Becket at Canterbury had the same honor in England. After the Reformation the practice of making pilgrimages fell more and more into abeyance, and the spirit which led to it seems almost to have become extinct among Christians, although there are still occasional outbursts of it among the Roman Catholics, as in the modern pilgrimages to Paray-le-Monial, Lourdes, Iona, and Holy Island. In the Greek church Mount Athos is the chief shrine of pilgrimage. For Mohammedans the great place of pilgrimage is Mecca, which was the resort of Arabian pilgrims long before the time of Mohammed. Among the Hindus and the Buddhists also the practice of performing pilgrimages largely prevails.

Pilgrim Fathers, the name given to the emigrants who, in order to escape from religious persecution, sailed from Southampton in the *Mayflower*, landing at what is now Plymouth in Massachusetts, in December, 1620, thus colonizing New England. They numbered 100 men, women, and children.

Pilibhît (pē-lē-bēt'), a town in India, in the district of Bareilly, in the Northwest Provinces, 30 miles northeast of Bareilly city, on the Desha River, the entrepôt for an extensive traffic between the upper and lower countries. The most important industry is sugar refining. In 1740 it was seized by the Rohilla leader, Hâfiz Rahmat Khân, who made it his capital. In the western outskirts stand his cathedral-mosque and the remains of his palace. Pop. about 35,000.

Pillar. See *Column.*

Pillar-Saints. See *Stylites.*

Pillau (pil'ou), a fortified seaport of East Prussia, at the entrance of the Frishes Haff, 25 miles w. s. w. of Königsberg, with which it forms one port. Large vessels for Königsberg are partially unloaded at Pillau. Pop. 7374.

Pillory (pil'u-ri), a frame of wood erected on posts, with movable boards, and holes through which were put the head and hands of a criminal for punishment. In this manner persons were formerly exposed to public

Pillory.

view, and generally to public insult. It was a common punishment in Britain for forestallers, users of false weights, those guilty of perjury, forgery, libel, seditious writings, etc. It was abolished in 1837.

Pills (pilz), medicines made up in globules of a convenient size for swallowing whole, the medicine being usually mixed up with some neutral substance such as bread-crumbs, hard soap, extract of liquorice, mucilage, syrup, treacle, and conserve of roses. The coverings are liquorice powder, wheat flour, fine sugar, and lycopodium. In many cases pills are now enameled or silvered, which deprives them of most of their unpleasantness. Pills are a highly suitable form for administering medicines which operate in small doses, or which are intended to act slowly or not to act at all until they reach the lower intestines, and in some other cases.

Pilot (pī'lut), a person qualified to navigate a vessel within a particular district. By the existing law, oversea vessels must employ a pilot in those parts of the voyage where a pilot is employed by regulation or usage. A master refusing to take a pilot vitiates the insurance on the vessel; while a pilot refusing to perform the duty for which he is licensed renders himself liable to penalties. The master or owner of a vessel is not responsible for damage caused by the fault or incapacity of any qualified pilot where the employment of such pilot is compulsory; but the pilot must not be interfered with in the discharge of his duties. Pilotage fees depend on the distance and the draught of water of the vessel piloted. Masters and mates passing the requisite examination are entitled to pilotage certificates to conduct their own vessels. Laws regulating pilotage have been enacted by the several maritime states — this power being controlled by Congress. The pilot laws of the states are different, some being unjust and burdensome, especially as to sailing vessels; while others are fair and equitable. A sailing or steam-vessel engaged in foreign trade must pay for a pilot even when one is not employed. The compulsory pilotage system is being abolished in many large foreign seaports, without detriment to the general safety of navigation.

Pilot-fish (*Naucrătes* or *Scomber ductor*), a genus of Teleostean fishes included in the Scomberidæ or mackerel family, and sometimes included in the same genus (*Scomber*) as the mackerel itself. The pilot-fish was formerly supposed to act as a pilot to the mariner, and is still

Pilot-fish (*Naucrătes ductor*).

supposed to act as such to sharks. It often follows in the wake of ships for long distances, associating with sharks and devouring the refuse thrown overboard. The average length is about 12 inches. In general form it resembles the mackerel.

Piloty (pē-lō'tē), Karl, a German painter, born at Munich in 1826; died in 1886. He studied at the Academy of Munich, and gained fame by his picture of *The Founding of the Catholic League* (1854). In 1856 he was appointed a professor in the Munich Academy of Arts. He devoted himself chiefly to historical subjects, and among his works are: *Seni by the Dead Body of Wallenstein; Nero among the*

Ruins of Rome; Mary Queen of Scotland receiving her Death Sentence; The Murder of Cæsar; Thusnelda in the Triumph of Germanicus; The Wise and Foolish Virgins; The Death of Alexander the Great. Piloty is reckoned the most remarkable representative of the realistic school of Germany.

Pilpay. See *Bidpai.*

Pilsen (pil'sen), a town in Western Bohemia, at the confluence of the Mies and Radbusa, 53 miles southwest of Prague. It consists of the town proper, with promenades on the site of the old ramparts, and of three suburbs. The principal buildings are the church (1292), town-house, real-school, and theaters. The chief article of manufacture and commerce is beer. Coal, iron, alum, etc., are worked in the neighborhood. The second town of Bohemia, Pilsen dates from 1272. During the Thirty Years' war it was for a time the headquarters of Wallenstein. Pop. (1910) 81,165.

Pilum. See *Javelin.*

Pimelodus (pim-i-lō'dus), a genus of malacopterygian abdominal fishes, found chiefly in South America, the Nile, and some of the eastern rivers, and supposed to abound in subterranean lakes, as one species (*P. cyclópum*), 6 inches long, is sometimes ejected in thousands from the craters of volcanoes.

Pimen'to, or PIMENTA. See *Allspice.*

Pimpernel (pim'pėr-nel; *Anagallis*), a genus of plants belonging to the nat. order of Primulaceæ. The *Anagallis arvensis*, or field pimpernel, a beautiful annual, is commonly known in England (where the scarlet-flowered variety is by far the most common) as the 'shepherd's or poor man's weather-glass,' from the fact that its flowers do not open in rainy weather. The blue and lilac varieties of the *Anagallis collīna*, originally a native of South Africa, have been introduced into gardens, where they have a fine effect. The water pimpernel is the *Veronica Anagallis;* the yellow pimpernel, *Lysimachia nemŏrum.*

Pimpinella. See *Anise.*

Pin, a piece of wire, generally brass, sharp at one end and with a head at the other, chiefly used by women in fastening their dress. By the old methods of manufacture by hand, the distinct processes, from the straightening of the wire to the spinning and hammering of the head, were usually said to be fourteen. Among the most important improvements introduced in the fabrication of pins are the machines by which the head is formed from the pin itself, and the machine for sticking the pins in paper — both American inventions. Solid-headed pins, now universally used, were first made in 1824. The consumption of pins in the United States is estimated at thirty millions a day.

Piña Cloth (pē'nya), a costly fabric made in Manila from the unspun fibers of the leaves of the cultivated pineapple plant (*Ananassa sativa*). Its color is almost white, but has a slight tinge of yellow in it. In spite of the delicacy of its texture it is remarkably strong. Its chief use is for making ladies' pocket handkerchiefs, but it is sometimes also used for dresses. It is frequently adorned with exquisite embroidery.

Pinacothek, or PINAKOTHEK (pi-na-kō-thek'; Gr. *pinakothēkē*), a name sometimes applied in Germany to galleries of art, especially collections of paintings. The Pinacothek formed by Louis I of Bavaria at Munich is particularly famous.

Pinar del Rio (pē-nàr' del rē'ō), the most westerly province of Cuba, bordering Havana province on the east. It is mountainous N. and W., low and marshy on the coast. Rivers and lakes are numerous, some of the rivers flowing underground. This province contains the fertile Vuelta Abajo district, in which grows the finest tobacco in the world. Sugar-cane, coffee, rice, sea-island cotton, corn, fruits, and fine woods are produced. Stock raising is also carried on. Area, 5000 sq. miles; pop. 257,893.

Pinar del Rio, a city, capital of above province. It is 95 miles W. S. W. of Havana, is in the center of the Vuelta Abajo district, and has an active trade in tobacco. Its seaport is Coloma, at the mouth of Coloma River, on the S. coast 14 miles away. Pop. 11,000.

Pinchot, GIFFORD, forester, born at Simsbury, Connecticut, in 1865. He was graduated at Yale in 1889, studied forestry in Europe, was made a member of the National Forest Commission in 1896, and was chief forester of the United States, 1898-1910. In the latter year he was dismissed by President Taft as a result of the Ballinger controversy concerning the Alaskan coal deposits. He was made president of the National Conservation Association in January, 1910, and became governor of Pennsylvania in 1923.

Pinckney (pink'ni), CHARLES COTESWORTH, statesman, was born at Charleston, South Carolina, in 1746. In the Revolutionary war he displayed resolution and intrepidity, and for two years suffered rigorous confinement. In 1787 he was a member of the convention that framed the Constitution. Washington in 1795 offered him the place of Secretary of War, and afterwards that of Secretary of State, in his cabinet, both of which he declined. He was sent to France as minister in 1796, and met a suggestion of obtaining certain advantages for his country by bribery with the striking utterance, 'Millions for defense, but not one cent for tribute.' He was appointed a major-general about 1798 and was a candidate of the Federal party, with John Adams, for the presidency in 1800, but was defeated. He died in 1825.

Pindar (pin'dar; PIN'DAROS), the greatest of the lyric poets of Greece, born in Bœotia, in or near Thebes, of a noble family, about 522 B.C. At an early age he was instructed in music and poetry; and for the development of his poetical talent he was sent to Athens, where he became the pupil of Lasus of Hermione, the founder of the Athenian school of dithyrambic poetry. In after-life he showed himself a great admirer of Athens and the Athenians, who rewarded him for the honors he paid to them by making him a public guest of the city and giving him a present of 10,000 drachmas, and after his death erected a statue in his honor. He was held in great honor by many princes of Greek states, for whom he composed choral songs, and had close relations with Delphi. Little is known with certainty of his life; even the date of his death is doubtful. The most probable account appears to be that he died at the age of eighty, in which case his death would fall about 442 B.C. He practiced all kinds of lyric poetry, and excelled equally in all. His works embraced hymns to the gods, pæans, dithyrambs, dancing and drinking songs, dirges, panegyrics on princes, and odes in honor of the victors in the great Grecian games, but the only poems of his which have come down to us entire belong to the last class, the Epinicia. Forty-five of the epinician odes of Pindar are still extant. Fourteen of these are in celebration of Olympic victors, twelve of Pythian, eleven of Nemean, and eight of Isthmian.

Pindar, PETER. See *Wolcott.*

Pindarees (pin'da-rēz; that is, *freebooters*), the name given in British India to the hordes of mounted robbers who for several years after 1812 infested Central India. They were descended mostly from the caste of Mohammedan warriors, which formerly received high pay from the Indian princes, and they were secretly excited by the Indian tributaries to attack the company. In 1817 the British governor-general, the Marquis of Hastings, determined on the destruction of these robbers, whose force was estimated at 40,000 horse. Attacked on all sides, they were conquered and dispersed. Garrisons were placed in some fortresses, and the native states of the infested district were formally taken under British protection.

Pind Dadan Khan, a prosperous commercial town, Jhelum district, Punjab, British India, near the north bank of the Jhelum River, with a trade in salt. Pop. 13,770.

Pindus (pin'dus), the ancient name of the principal mountain range of Northern Greece, forming the watershed of the country and the boundary between Thessaly and Epirus. It was, like Helicon and Parnassus, a seat of Apollo and the Muses.

Pine (pīn), the popular name of trees of the genus *Pinus*, natural order Coniferæ, which is divided into two suborders, namely, 1. *Abietineæ*, the fir tribe; and 2. *Cupressineæ*, the cypress tribe. The pines belong to the former section, and are distinguished from the spruce, larch, fir, cedar, etc., chiefly by having persistent leaves in clusters of two to five in the axils of membranous scales. All the European species, except *P. Cembra*, have only two leaves in a sheath; most of the Asiatic, Mexican, and California kinds have three, four, or five leaves, and those of the United States and Canada have generally three. The cones also afford an important ready means of distinction and classification. The Scotch pine or fir (*P. sylvestris*) is a tall, straight, hardy tree, from 60 to 100 feet high; a native of most parts of Europe, flowering in May and June, and having many varieties. There are extensive forests of it in Russia, Poland, Sweden, Norway, Germany, the Alps, the Pyrenees, and the Vosges. In Scotland it grows at the height of 2700 feet on the Grampians. The Corsican pine (*P. Laricio*) grows to a height of from 80 to 100 feet, and in the island of Corsica it is said to

reach an altitude of 140 to 150 feet. The pinaster, or cluster pine (*P. pinaster*), is indigenous to the south of Europe, to the west of Asia, the Himalayas, and, it seems, even to China. It is a large, handsome, pyramidal tree, varying from 40 to 60 feet in height. Its cones point upwards, in star-like clusters, whence the name of pinaster or star pine. In France, especially between Bayonne and Bordeaux, it covers immense tracts of barren sand, in which it has been planted to prevent the sand from drifting. The stone pine (*P. pinĕa*) is a lofty tree in the south of Europe, where it is a native; its spreading head forms a kind of parasol; the trunk is 50 or 60 feet high, and clear of branches. Sabine's pine (*P. Sabiniāna*) was discovered in California in 1826. The leaves are in threes, rarely in fours, from 11 to 14 inches long; the trees are of a tapering form, straight, and from 40 to 120 feet high, with trunks from 3 to 12 feet in diameter. The Cembran pine (*P. Cembra*) is a native of Switzerland and Siberia. The red Canadian pine (*P. resinōsa*), or yellow pine, inhabits the whole of Canada from the Atlantic to the Pacific, and is also found in the northern and eastern parts of the United States. The trunk rises to the height of 70 or 80 feet by about 2 in diameter at the base, and is chiefly remarkable for its uniform size for two-thirds of its length. The wood is yellowish, compact, fine-grained, resinous, and durable. The true yellow pine (*P. variabĭlis*) abounds in the Atlantic states from New Jersey to Virginia, and rises to the height of 50 or 60 feet, by 15 or 18 inches in diameter at base. The cones are small, oval, and armed with fine spines. The timber is largely used in shipbuilding and for house timber. The white pine (*P. strobus*) abounds chiefly from lat. 43° to 47° and southward to the Alleghanies. The timber is not strong, but is easily wrought and durable, and its timber is consumed in much greater quantity and for a wider variety of purposes than any other. The demand for it has been so great that the former great white pine forests are almost denuded. The Labrador or Banks's pine (P. *Banksiāna*) is usually a low, straggling tree, growing among barren rocks to a height of from 5 to 8 feet, but may attain three times that height. The cones are recurved and twisted, and the leaves are regularly distributed over the branches. In Nova Scotia and the state of Maine it is known as the scrub pine, and in Canada as the gray pine. The other American pines are the Jersey pine (*P. inops*), the trunk of which is too small to be of any utility in the arts; the pitch pine (*P. rigida*), which is most abundant along the Atlantic coast, and the wood of which, when the tree grows in a dry, gravelly soil, is compact, heavy, and contains a large proportion of resin; the loblolly pine (*P. tæda*), the timber of which decays speedily on being exposed to the air; the long-leaved pine (*P. palustris*), which abounds in the lower part of the Carolinas, Georgia, and Florida, furnishing resin, tar, pitch, and turpentine, and timber which is hardly inferior to the white oak in naval architecture; and Lambert's pine (*P. Lambertiana*), which grows between the fortieth and forty-third parallels of latitude, and about 100 miles from the Pacific. It is of gigantic size, the trunk rising from 150 to upwards of 200 feet, and being from 7 to nearly 20 feet in diameter.

Pineal Gland (pin'e-al), in anatomy, is a body (not properly a gland) forming part of the brain. It is about the size of a pea, and is connected with the cerebrum at its base by four peduncles or stalks and by some few cross-fibers. Its function is not known. It was considered by the ancients to be the seat of the soul.

Pineapple (*Ananassa satīva*), a plant belonging to the nat. order of Bromeliaceæ, much esteemed for its richly-flavored fruit, which somewhat resembles a pine-cone. A native of tropical America, it is now naturalized in many hot countries, is grown in the warmer regions of the United States, and is also cultivated in hot-houses. It is largely grown in Hawaii and exported in the canned state to the United States. The common pineapple plant yields the fiber of which, in Manila, the beautiful piña cloth is made. (See *Piña Cloth.*) The fiber is also used for textile purposes in China and India.

Pineapple fruit.

Pine Bluff, a city, capital of Jefferson county, Arkansas, is situated on the Arkansas River, 71 miles

above its mouth. It is in the heart of the cotton and pine and hardwood timber belt. Has an immense cotton trade, cotton oil and woodworking mills, railroad shops, etc. Pop. (1910) 15,102; (1920) 19,280.

Pine-chafer, or PINE BEETLE (*Hylophăgus piniperda*), a species of beetle which infests Scotch pines. It feeds on the young shoots of these trees and eats its way into the heart, thus converting the shoot into a tube.

Pine-finch, or PINE-GROSBEAK (*Pinicŏla* or *Pyrrhŭla enucleātor*), a genus of conirostral perching birds or Insessores, belonging to the subfamily of the bullfinches (*Pyrrhulīnæ*). It is of larger size than the common bullfinch, and measures from 8 to 9 inches in length. It occurs in the Arctic and northern regions of both Old and New Worlds. It is more rarely found in the temperate portions of Europe. Its song notes are agreeable, and its flesh is esteemed in Russia.

Pinel (pē'nel), PHILIPPE, the Howard of the insane, was born in 1745, at St. André, in the French department of Tarn, and studied at Toulouse (where he took his doctor's degree in 1773) and Montpellier. In 1778 he went to Paris, and in 1791 came into notice by his treatise *Sur l'Aliénation Mentale*. In the following year he was made directing physician at the Bicêtre, and in 1794 at Salpêtrière. By his writings and by his management of these two asylums, in which he introduced the humane treatment of the insane, Pinel laid the foundations of the great reform that has been effected in treating mental diseases. He died at Paris in 1826.

Pine-resin, a resin contained in the juice which exudes from pines, firs, and other coniferous trees. These resins generally contain oxygen with volatile oils, and sometimes acid bodies.

Pinero (pi-nē'rō), ARTHUR WING, actor and dramatist, son of a solicitor, was born in London in 1855, and made his *début* upon the stage at Edinburgh in 1874, subsequently joining the Lyceum and Haymarket companies. He is the author of several successful plays, including *The Squire*, *Sweet Lavender*, *The Second Mrs. Tanqueray*, *The Princess and the Butterfly*, etc.

Pinerolo (pē-nā-rō'lō; French, *Pignerol*), an ancient city of Italy, province of Turin, 21 miles southwest of the city of that name, at the mouth of the Val Clusone. It has a cathedral, bishop's palace, lyceum, technical school, etc. The manufactures are chiefly cotton, woolen, and silk goods. It belonged to Savoy from 1042, but the French held it for a series of years on several occasions; and its citadel was at one time the prison of the Man with the Iron Mask. Pop. 12,608.

Piney Tallow, called also Malabar tallow, is a fatty substance resembling wax, obtained by boiling with water the fruit of the *Vateria Indica*, a tree common on the Malabar coast. It forms excellent candles.

Piney Varnish, a resin used as a varnish obtained from two trees of S. India and Ceylon, *Vateria Indica* and *V. acuminata*. It is known also as piney resin, white dammar, and Indian coral, and is got by making incisions on the bark of the tree or into its substance. It is soluble in turpentine and drying oils.

Ping Pong, table lawn-tennis, introduced from England to the United States in the early twentieth century and for a time very popular. It is played in a room, but resembles the regular game of tennis.

Pingree (pin'grē), HAZEN S., reformer, born at Denmark, Maine, in 1842; died in 1901. He served in the Civil war; engaged in the shoe business in Detroit, and became very successful. Elected mayor of Detroit in 1889, on the Reform ticket, he excited much attention by his opposition to street railway methods, and instituted an interesting plan for employing applicants for charity. He was elected governor of Michigan in 1897, and again in 1898.

Pinguicula (pin-gwik'ū-la), a genus of plants of the natural order Lentibulariaceæ, with rosettes of fleshy radical leaves, and solitary purple, violet, or yellow flowers. See *Butterwort*.

Ping-Yang, a town of Korea, on the Ta-tong River, 35 miles above its mouth. It is of great antiquity and is surrounded by an imposing wall, but is open to trade. Its population has lately much increased, and is now about 146,000.

Pinion (pin'yun), in machinery, a small wheel which plays in the teeth of a larger one, or sometimes only an arbor or spindle in the body of which are several notches forming teeth or leaves, which catch the teeth of a wheel that serves to turn it round.

Pink (*Dianthus*), a genus of plants belonging to the natural order Caryophyllaceæ. More than 100 species are known, all, with perhaps one or two exceptions, natives of the northern and

temperate parts of the European continent. Their roots are annual or perennial; the stems herbaceous and jointed; the leaves opposite and entire, and the flowers terminal, aggregate, or solitary, and always beautiful. The clove pink or carnation, and the garden pink, of which there are many varieties, are familiar species.

Pinkerton (pin'kėr-tun), ALLAN, detective, born at Glasgow, Scotland, in 1819; died in 1884. He migrated to Canada in 1840 and went to Chicago in 1850, where he joined the detective department. He subsequently organized the detective agency which bears his name. He wrote interesting stories of his experiences as a detective.

Pinkerton, JOHN, a Scottish antiquary, born at Edinburgh in 1758. He was articled to a writer to the signet, but in 1780 went to London to devote himself to literature, and by his *Letters on Literature* obtained the acquaintance of Horace Walpole. His more valuable publications are: *Ancient Scottish Poems*, from the Manuscript Collection of Sir Richard Maitland of Lethington, with Notes and a Glossary (1786); *Inquiry into the History of Scotland preceding the Reign of Malcolm II or 1056* (1790), containing a curious discussion of the 'Pictish question'; *The Medallic History of England; Scottish Poems*, reprinted from scarce editions; and a *General Collection of Voyages and Travels* in 19 large volumes. He died at Paris in 1826.

Pin-money, an annual sum of money, sometimes provided for in a marriage settlement, to be paid by the husband to the wife for her separate use, and to be applied in the purchase of apparel, ornaments for her person, or for private expenditure.

Pinna (pin'a), or WING SHELL, a genus of Lamellibranchiate Mollusca included in the family Aviculidæ. The genus is represented by the *Pinna pectināta* of the British coasts, by the *P. nobilis* of the Mediterranean Sea, by the *P. bullāta*, *P. rudis*, *P. nigrīna*, and by other species. Some species attain large dimensions, being as much as 2 feet long. The 'byssus,' by which they adhere to rocks, is remarkably long, and of strong, silky texture, and is capable of being woven into cloth upon which a very high value is set. This manufacture was known to the ancients, and is still practiced in Italy to some extent.

Pinnace (pin'as), a small vessel used at sea. It is equipped with sails and oars, and also has two or three masts which are schooner-rigged. One of the boats of a man-of-war, used to carry the officers to and from the shore, is also called the pinnace. It is usually rowed with eight oars.

Pinnacle (pin'a-kl), in architecture, any lesser structure that rises above the roof of a building, or that caps and terminates the higher parts of angles or of buttresses. The application of the term is now generally limited to an ornamental pointed mass rising from angles, buttresses, or parapets, and usually adorned with rich and varied devices. They are usually square in plan, but are sometimes octagonal, and in a few instances hexagonal and pentagonal. The tops are generally crocketed, and have finials on the points.

Pinnacle, Trinity Church, Cambridge.

Pinnate (pin'āt), in botany, formed like a feather. A pinnate leaf is a species of compound leaf wherein a single petiole has several leaflets or pinnules attached to either side of it.

Pinnate Leaf.

Pinnated Grouse, known also as the prairie hen, or prairie chicken, a common game bird in the Mississippi Valley, north of Louisiana. The male is remarkable as possessing two erectile tufts in the nape, and an air bladder (connected with the windpipe, and capable of inflation) on each side of the neck, in color and shape resembling small oranges; general plumage brown, mottled with a darker shade.

Pinnigrada (pin-i-grā'da), or PINNIPEDIA, a section of the carnivorous order of mammals, in which the fore and hind legs are short, and are expanded into broad-webbed swimming paddles. The section comprises the seals and walruses.

Pinocle, PINOCHLE (pin'o-kl), a card game resembling the French game of bezique, of late years very popular in sections of this country. It is usually played with parts of two packs of cards, from the nines to the aces, or more recently from the sevens. The values range as follows: Ace, ten, king, queen, knave, and nine. Game is counted by marriages (king and queen of one suit), fours (aces, kings, etc.), pinocle (queen of spades and knave of dia-

monds), deuce (nine of trumps), and by trump sequence (knave to ace). Each of these counts has its special value. Game is also counted from tricks taken, each ten, ace, and king counting ten points. When played by three or more players, the melds or counts are declared before the play begins.

Pinos, ISLA DE. See *Isla de Pinos.*

Pinsk, a town of Western Russia, in the government of Minsk, on the navigable river Pina. It stands among marshes, and is built of wood. It has an active transit trade. Pop. 28,028. — The Pinsk Marshes, which cover an immense extent of country, are now in process of being drained.

Pint (pīnt), a measure of capacity used for both liquids and dry goods; it is the eighth part of a gallon, or 34.65925 cubic inches. The Scotch pint was equal to 3.0065 imperial pints.

Pintado. See *Guinea-fowl.*

Pintail Duck, a genus of ducks, so named from the elongated form of the tail-feathers. In size the common pintail duck (*Dafila acūta*) is equal to the mallard. These birds are common to the Mississippi Valley, and they occur on the Mediterranean coasts, in the Gulf of Mexico, in the West Indian Islands, and in Africa. They breed in confinement, and the flesh is savory.

Pinto (pēn'tō), MAJOR SERPA, a Portuguese traveler, born in 1846, and educated at the Royal Military College, Lisbon; entered the Portuguese army in 1863. In 1877–79 he crossed Africa from Benguela to Durban, and described his journey in a work entitled *How I Crossed Africa* (London, 1881), which procured him many honors, especially from geographical societies. He has led several exploring expeditions, and his proceedings in the Zambesi district led in 1890 to a vigorous and successful protest by Britain against the claims of Portugal in that quarter.

Pinturicchio (pin-tu-rik'yō; 'the little painter'), an eminent Italian painter of the Umbrian school, whose real name was BERNARDINO DI BETTO, was born at Perugia in 1454; died at Siena in 1513. He lived for a time at Rome, and while there was engaged on the frescoes of the Sistine Chapel, being at this time under the influence of Perugino. His chief work was a series of mural paintings illustrating the life of Pope Pius II (Æneas Silvius), in the cathedral library at Siena. There are also fine frescoes by him in the Buffalini Chapel of the Church of St. Maria in Araceli, Rome. He left many exquisite altar-pieces and other works in tempera; he never painted in oil.

Pinus. See *Pine.*

Pinzon (pēn-thon'), a family of Spanish navigators, natives of Palos, who were associated with Columbus in the discovery of America.— MARTIN ALFONSO, the eldest, was of great assistance to Columbus in fitting out his fleet, and in the voyage commanded the *Pinta.*— VICENTE YAÑEZ, his brother, commanded the *Niña* in the first voyage of Columbus.— FRANCISCO MARTIN, the third brother, was pilot of the *Pinta* in the first voyage of Columbus. From him descended the noble Spanish family of Pinzon.

Piombino (pē-ōm-bē'no), a town of Italy, province of Pisa, on the seacoast opposite the island of Elba. It has old fortifications, a good harbor, and manufactures of Bessemer steel and military projectiles. Pop. 5979. Piombino was formerly the capital of a small principality.

Piombo (pē-om'bō), SEBASTIANO LUCIANI DEL, a celebrated painter, born at Venice in 1485. He studied under Giovanni Bellini and Giorgione, whose fine coloring he imitated. Coming to Rome about 1512, he was induced by Michael Angelo to enter into rivalry with Raphael. When Raphael painted his celebrated *Transfiguration*, Sebastiano attempted to surpass it by painting the *Raising of Lazarus*, which is considered his greatest work, and is now in the National Gallery, London. Other important works are *The Scourging of Our Lord*, and *A Holy Family*. His chief merit, however, lay in single figures and portraits, such as his Clement VII. He was high in favor with Clement, who created him keeper of the papal seals. From this circumstance he derived his surname *Del Piombo*, the seals attached to the papal bulls being at that time of lead (*piombo*). He died in 1547. He preferred oil painting to fresco, and some of his later works are executed on slate.

Pioneers (pī-u-nērz'), laborers attached to an army for the making and repairing of roads, digging trenches, and preserving cleanliness in the camp when stationary, etc. A number of men are now attached to each corps as a permanent body of pioneers. In a general sense the word is applied to all those who precede others in any enterprise.

Piotrkov (pyotr'köf), a town of Russian Poland in the government of same name, one of the oldest towns of Poland. It was at one time the seat of the Polish diet, and the kings were elected here. Pop. 41,181.—The government has an area of 4729 sq. miles. It is moderately fertile, and has considerable manufactures of cottons and woolens. Pop. 1,406,951.

Piozzi (pē-oz'ē), Hester Lynch Salusbury, an English authoress, the daughter of John Salusbury of Bodville, Carnarvonshire, was probably born in 1741; died at Clifton in 1821. Early in life she was distinguished by her beauty and accomplishments. In 1763 she was married to Henry Thrale, a wealthy brewer of Southwark, London, which borough he then represented in parliament. Soon after her marriage she gathered round her a brilliant circle, including above all Dr. Johnson, who lived with the Thrales for sixteen years. Mr. Thrale dying in 1781, his widow, who was the mother of four daughters, married in 1784 Piozzi, a Florentine music-master, then resident in Bath. This alliance was keenly resented by all her friends, and Johnson entirely gave up her society. Her *Anecdotes of Dr. Johnson* appeared in 1786, and her *Letters* to and from Dr. Johnson in 1788. She also wrote a few poems, an autobiography, etc.

Pipa (pī'pa), a genus of toads, of which the best known species is the *Pipa Americana* of Surinam and Brazil, popularly designated the Surinam toad. The tongue and teeth are wanting in this family. The pipa is one of the

Pipa Toad (*P. surinamensis*).

most repulsive looking of the toads, and is noted as exemplifying, in the case of the female animals, an anomalous mode of developing the eggs and young. A number of pits or depressions termed 'dorsal cells' appear to be formed on the back of the female pipas at the breeding season. In each cell an egg is deposited, the eggs being first deposited by the female in water after the usual method, and being impregnated by the male, who then collects the eggs and places them in the female's back. Each cell appears to be closed by a lid-like fold, and within the cells the eggs are hatched and the young pass their tadpole state.

Pipe (pīp), a wine measure, usually containing very nearly 105 imperial or 126 wine gallons. Two pipes or 210 imperial gallons make a tun. In practice, however, the size of the pipe varies according to the kind of wine it contains. Thus a pipe of port contains (about) 138 wine-gallons; of sherry, 130; of Madeira, 110, etc.

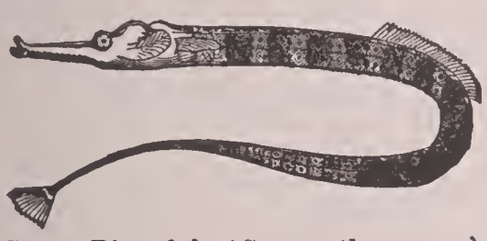
Pipe, a tube for the conveyance of water, steam, gas, or other fluid, used for a great variety of purposes in the arts and in domestic economy. The materials of which pipes are made are also very various, wood, stone, earthenware, iron, lead, copper, leather, gutta-percha, etc., being all employed. Drainage and sewerage pipes of great strength and size (measuring from 1 or 2 up to 54 inches in diameter) are now usually made of fire-clay, glazed on their outer and inner surfaces. Large iron pipes are usually cast, and are used for the supply of water and gas.

Pipe, Tobacco, a bowl and connecting tube, made of baked clay, wood, stone, or other material, and used in smoking tobacco. The chief processes in the manufacture of clay pipes are molding and baking. Finer and more expensive pipes are made of meerschaum, a somewhat plastic magnesian stone of a soft, greasy feel. Meerschaum pipe making is carried on to the greatest extent by the Germans, and Vienna may be said to be the center of the manufacture. Sometimes the bowl alone (which is frequently artistically carved) is of meerschaum, the stem being of wood, the best sorts of which are got from the young stems of the Mahaleb cherry, grown near Vienna, the mock orange of Hungary, and the jessamine sticks of Turkey. The stem, whether of the same material as the bowl or of wood, is usually provided with a mouthpiece of ivory, silver, or amber, the last being preferred. Briar-root pipes, with the bowl and stem of one piece of wood, and provided with amber, ivory, or bone mouthpieces, are now very common. They are made of the roots of a large variety of heath (Fr. *bruyère*). Corn-cob pipes, made from the ears of maize, have attained wide popularity in America. Pipes with painted porcelain bowls are favorites in northern Europe. The Eastern

hookah is a pipe of great size, the bowl of which is set upon an air-tight vessel partially filled with water, and has a small tube which passes down into the water. The long flexible smoking-tube is inserted in the side of the vessel, and the smoke is made to pass through the water, being thus cooled and deprived of some noxious properties. Upon the American continent pipes have been in use from a very remote period. Indian pipes, with elaborately carved soapstone bowls and ornamented wooden stems, or entirely of baked clay, have been found in the ancient mounds of the West, together with other relics of an unknown race. See *Calumet*.

Pipe-clay, a fine white clay which is used for making tobacco pipes and articles of pottery, also for cleaning soldiers' belts, etc. See *Clay* and *Pipe* (*Tobacco*).

Pipe-fishes (*Syngnathus*), a genus of fishes included in the suborder Lophobranchii and nearly allied to the curious little fishes popularly known as 'sea-horses' (see *Hippocampus*). They are distinguished by a long and tapering body, and by jaws united to form a tube or pipe, bearing the mouth at the tip. The *Syngnathus acus* is one of the most familiar species. It averages 20 inches in length. The largest of the pipe-fishes is said to attain a length of 3 feet. A very remarkable circumstance in connection with the pipe-fishes consists



Great Pipe-fish (*Syngnathus acus*).

in the males of some species possessing a pouch-like fold, situated at the base of the tail, in which the eggs are contained after being extruded from the body of the females, and in which the young, after hatching, continue to reside for a time. The name pipe-fish is also applied to the members of the genus *Fistularia*, included in the Acanthopterous division of the Teleostei. The bones of the face are prolonged to form a tubular structure, at the extremity of which the mouth opens. The *Fistularia tabacaria* of the Antilles, averaging about 3 feet in length, represents this genus.

Piperaceæ (pī-pėr-ā'se-ē), the peppers, a natural order of shrubby or herbaceous exogenous plants, inhabiting the hottest parts of the globe, particularly India and South America. The general properties of the order are aromatic, pungent, and stimulant. The dried unripe fruits of *Piper nigrum* constitute black pepper. (See *Pepper*.) The fruit of *Cubeba officinālis*, a climbing plant of Java and other Indian islands, is the Cubeb pepper. (See *Cubebs*.) The leaves and unripe fruit of *Piper angustifolium* constitute the aromatic, fragrant, and astringent substance called *matico* or *matica*, which has been recommended for checking hemorrhage. The leaves of *Piper Betle* (*Chavica Betle*) are chewed in the East as a means of intoxication. (See *Betel*.) The root of *Macropiper methysticum* is the *kava* of the South Sea Islanders, and is used in the preparation of a stimulating beverage.

Pipette (pi-pet'), an instrument used by chemists, druggists, etc., consisting of a glass tube with a bulging expansion about the middle, into which a certain quantity of liquid may be sucked by the mouth or a rubber bulb, so as to be transferred from one vessel to another.

Piping Crow, a bird of New South Wales, remarkable for its musical powers, and for its power of mimicing the voices of other birds. It is the *Barita tibicen*, and by some naturalists is placed among the shrikes (Laniidæ), by others among the crows (Corvidæ).

Pipistrelle (pip-is'trel; *Vespertilio Pipistrella*), the familiar little bat which makes its appearance and flits about during twilight. It is of small size, and possesses a mouse-like body covered with hair, from which resemblance its popular name of Flittermouse has been derived. It passes the winter, like most other bats, in a state of torpidity; but appears to hibernate for a shorter period than other and larger species.

Pipit (pip'it), or Titlark (*Anthus*), a genus of perching birds possessing striking affinities with the larks, which they resemble in the large size of the hinder claw, but commonly classed with the wagtails, which they closely resemble in their habits of running swiftly on the ground. The meadow pipit or titlark (*Anthus pratensis*) is the commonest British species. The shore pipit, or rock lark (*A. petrōsus*), frequents the sea-beach, and feeds on molluscs and crustacea. The tree pipit or titlark (*Anthus arborĕus*) is a summer visitant only in the British Isles. All the pipits build their nests on the ground. The song in all consists of a clear, simple note. The *Anthus ludovi-*

cianus, 6 to 7 inches long, is common in North America.

Pippin (pip'in). the name given to a certain class of dessert apples, probably because the trees were raised from the pips or seeds, and bore the apples which gave them celebrity without grafting. The Ribston, Golden, and Newton pippins are favorite varieties, well known in the United States.

Pipra (pip'ra), a genus of passerine birds which inhabit South America. See *Manakin*.

Piqua (pik'wa), a city of Miami Co., Ohio, on Miami River and Miami & Erie Canal, 90 miles N. E. of Cincinnati. It has underwear mills (2000 employees), and manufactures of blankets, felt, shovels, stoves, furniture, phonographs, wheel spokes, airplane propellers, oil mill machinery, etc. Pop. (1910) 13,388; (1920) 15,044.

Piquet (pi-ket'), a game at cards played between two persons with thirty-two cards, all the plain cards below seven being thrown aside. In playing, the cards rank in order as follows: the ace (which counts eleven), the king, queen, and knave (each of which counts ten), and the plain cards, each of which counts according to the number of its pips. The player who first reaches 100 has the game. The score is made up by reckoning in the following manner: — Carte blanche, the point, the sequence, the quatorze, the cards, and the capot. Carte blanche is a hand of twelve plain cards, and counts ten for the player who holds it. The point is the suit of highest value, the value being determined by the number it makes up when the cards held are added together. The sequence is composed of a regular succession of cards in one suit. The quatorze is composed of four aces, four kings, four queens, four knaves, or four tens, and counts fourteen. The winner of the greatest number of tricks counts ten in addition (the 'cards'); if he holds all the tricks he counts forty in addition (the 'capot'). If a player scores twenty-nine in hand and one for the card he leads, before his opponent counts anything, he at once adds thirty to his score; this is called 'pique.' Should a player score thirty by the cards in his hand, by scores that reckon in order before his adversary can count, he obtains the 'repique,' which enables him to add sixty to his score. The scores are recorded according to the following table of precedence: 1, carte blanche; 2, point; 3, sequences; 4, quatorzes and trios; 5, points made in play; and 6, the cards. If one player scores a hundred before the other obtains fifty he wins a double.

Piqué-work (pē-kā'), a fine kind of inlaid work, resembling buhl-work (which see), but much more expensive and elaborate, the inlay being minute pieces of gold, silver, and other costly materials.

Piracy (pī'ra-si), those acts of robbery and depredation upon the high seas, or other places where the admiralty has jurisdiction, which, if committed upon land, would have amounted to felony only. This is substantially the definition of this offense by the law of the nations, which, on conviction, is punished with death in the United States, and generally in other civilized countries. It is an offense against the universal law of society, a pirate being, according to Coke, *hostis humani generis*. Piracy in the common sense of the word is distinguished from privateering by the circumstance that the pirate sails without any commission, and under no national flag, and attacks the subjects of all nations alike; the privateer acts under a commission from a belligerent power, which authorizes him to attack, plunder, and destroy the vessels which he may encounter belonging to the hostile state. Piracy has existed from a very early period, being considered a reputable pursuit by the ancient Greeks and Phœnicians. It continued until the last century, when it was commonly practiced by the Algerians and other north African sea-rovers. It now exists only in Chinese and Malayan waters.

Piræus (pi-rē'us; Greek, *Peiraieus*), the principal port of both ancient and modern Athens, is situated about 5 miles from that city, on a peninsula. It has three harbors: two on the east side, anciently named Zea (now Stratiotiki) and Munychia (now Phanari), and one on the west side, called simply Piræus, or the Harbor, the largest of the three. The Piræus was anciently connected with Athens by walls known as the Long Walls. When Greece was liberated from Turkish rule the Piræus was merely a scene of ruins. Since then a flourishing industrial and trading town has grown up, which is connected with Athens by a railway. Pop. 42,167.

Pirai, or PIRAYA (pi-rā'ya), the *Serrasalmo Piraya*, a voracious fresh-water fish of tropical America. It is 3 or 4 feet in length, and its jaws are armed with sharp, lancet-shaped teeth, from which cattle when fording rivers sometimes suffer terribly.

Piranesi (pē-ra-nā'sē), GIOVANNI BATTISTA, an Italian archi-

tect, engraver, and antiquary, was born at Venice in 1720, but passed the greater part of his life at Rome. His chief work, the *Antiquities of Rome*, was in 29 vols., with about 2000 copper plates giving views of Rome and its buildings. His representations are not always faithful, on account of the scope which he gave to his imagination. He died in 1778.

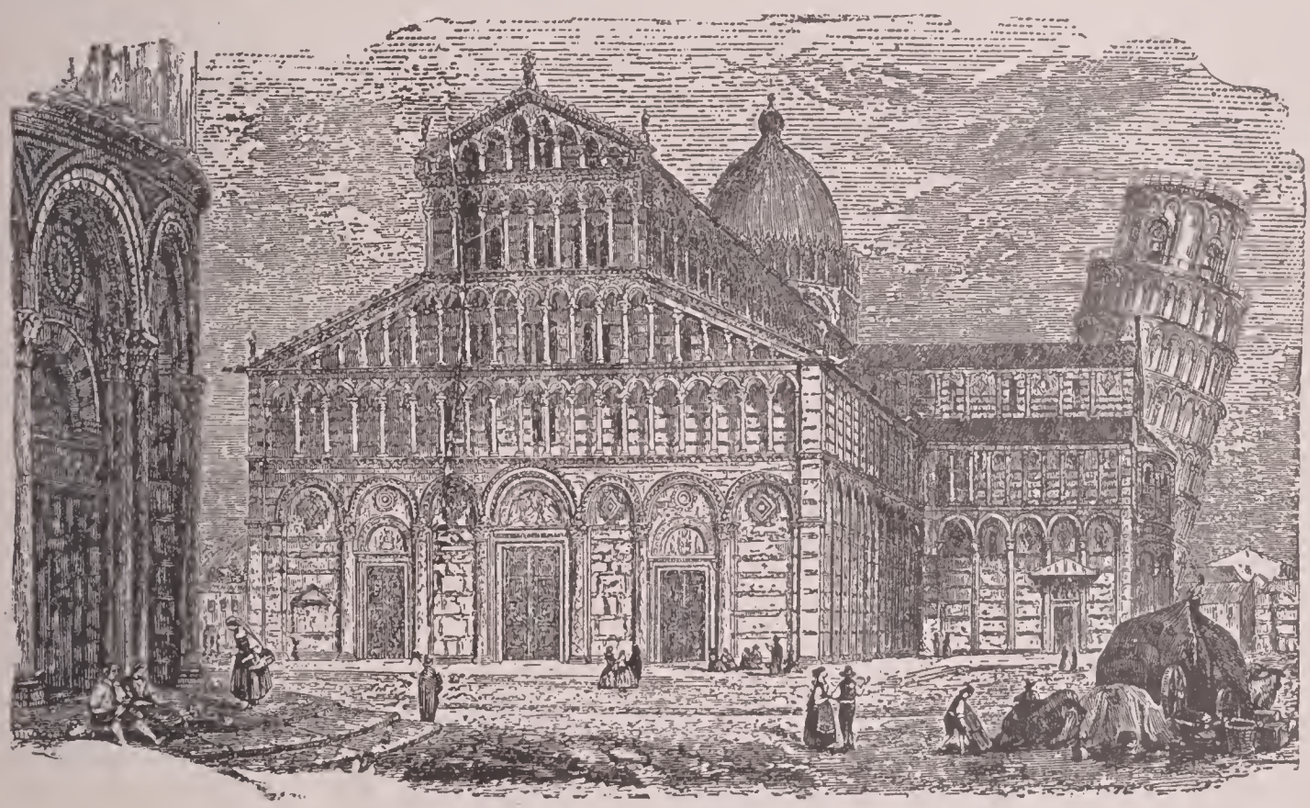
Pirano (pē-rä′nō), an Austrian seaport in Istria, near the head of the Adriatic, 13 miles southwest of Trieste. There is good anchorage for the largest vessels in the well-sheltered roadstead. The principal objects of commerce are wine and olive-oil. Pop. 13,339.

Pirmasens (pėr′mä-sens), a town of Bavaria, in the Palatinate, 22 miles w. s. w. of Landau. It is well built, has a good town-house and manufactures of shoes, musical instruments, leather, machinery, etc. Pop. (1910) 38,463.

Pirna (pėr′nä), a town of Saxony, 10 miles from Dresden, on the right bank of the Elbe. It has manufactures of stoneware, chemicals, cigars, beer, etc., and a considerable trade on the Elbe. Pop. (1910) 21,035.

Piron (pē-roṇ), Alexis, a French wit, poet, and dramatist, born at Dijon in 1689. He studied law at Besançon; but having gone to Paris he wrote for the Theater of the Comic Opera, and his first piece was *Arléquin Deucalion*, composed in two days. His success induced him to persevere, and after writing several pieces, he produced in 1738 his *chef-d'œuvre*, *Métromanie*, a comedy which Laharpe characterizes as excelling in plot, style, humor, and vivacity almost every other composition of the kind. Piron afterwards wrote *Fernand Cortes*, a tragic drama, and some other pieces, which obtained some success. He died in 1773.

Pisa (pē′zȧ; the ancient *Pisæ*), a town of Northern Italy, capital of the province of the same name, 6 miles from the Mediterranean, and 44 miles west of Florence, on both banks of the Arno, here crossed by three stone bridges for general traffic, and one carrying the railway. It is surrounded by walls and ditches, and defended by a citadel, the fortified circuit having a length of nearly 6 miles, much of the space inclosed being unoccupied. The river is lined by handsome quays on both sides (known as the Lungarno); the streets are spacious and well paved; and the houses are remarkable for the profusion with which marble has been employed in their construction. In the northwestern part of the city is a remarkable group of buildings consisting of the Duomo or Cathedral, the Baptistery, the famous 'Leaning Tower,' and the Campo Santo. The Cathedral, begun in 1063, conse-



Baptistery, Cathedral, and Campanile, Pisa.

crated in 1118, is one of the noblest ecclesiastical structures of Italy, built of marble, in the form of a basilica, with a rich façade and a dome of peculiar shape; the Baptistery, begun in 1153 and finished in 1278, is a large rotunda, adorned externally by a series of arcades with decorated canopies, and crowned by a dome of peculiar design, 190 feet high; the Campanile, or 'Leaning Tower,' is of cylindrical shape, built of white marble, and has the whole exterior enriched by a succession of arcades extending from base to summit: its height is 179 feet, and it deviates 13 feet from the perpendicular. The Campo Santo, or cemetery, is the most remarkable structure of the kind in existence, consisting of a court surrounded by arcades of white marble, adorned with sculptures and frescoes, by the earlier Italian masters, and full of remarkable monuments. Other edifices are the town-house (Palazzo del Commune); the courthouse (Palazzo Pretorio); and the university, anciently famous, and still one of the most celebrated in Italy. The manufactures consist chiefly of silk, woolen, and cotton goods. The population, which reached 150,000 when the city was in its zenith, is now only 67,300. The province of Pisa has an area of 1185 square miles, and a population of 352,000. —Pisa was an ancient Etrurian city, and one of the twelve cities of the confederation. In 180 B.C. it became a Roman colony. About the beginning of the Christian era it was a flourishing city. On the fall of the Roman Empire it was pillaged by the Goths, and afterwards subjected by the Longobards. In the tenth century it had succeeded in taking a lead among the Italian states; but, after protracted and unsuccessful wars with Genoa at the end of the thirteenth, and with Florence at the end of the fifteenth century, it was finally compelled by famine to submit to the Florentines (June 8, 1509), and thus ceased to be independent. On the ruins of Pisa was founded the power of the Grand-duchy of Tuscany.

Pisa, Council of, a special council of the Roman Catholic Church, held to consider the pretensions of the rival popes of Avignon and of Rome, opened March 25, 1409. The rival popes, Benedict XIII (of Avignon) and Gregory XII (of Rome) were summoned to appear within a stated period, but refused to comply. After mature deliberation both popes were formally deposed, and Cardinal Pietro Philargi, Archbishop of Milan, was elected. The authority of the council was not, however, generally recognized, and it was not until 1417 that the schism can be said to have terminated.

Pisano (pē-sä'nō), Niccolo, an Italian sculptor and architect, born at Pisa about 1205 and spent the most of his life there; died in 1278. He holds an important place in the history of Italian art, inasmuch as his works presented a sudden and new development and far surpassed those of his immediate predecessors. Among his famous works are the reliefs of the baptistery of Pisa, the choir of the cathedral of Siena, and the beautiful sarcophagus of St. Dominic in Bologna. His chief architectural works are churches in Pisa, Pistoja, and Volterra.

Pisces, or Fishes. See *Ichthyology.*

Pisces (pis'ēz; the Fishes), a sign of the zodiac, which is entered by the sun about the 19th of February. The constellation which occupies the zodiacal region corresponding to the sign has the same name; it contains some interesting double stars.

Pisciculture (pis'i-kul-tūr), the breeding, rearing, preservation, feeding, and fattening of fish by artificial means. Pisciculture has been practiced from very remote ages, having been in use in ancient Egypt, and followed in China in early times on a very large scale. The art, so far as the perfecting of natural conditions under which fish live and thrive, without interfering directly with the ordinary processes of nature, has thus always been more or less practiced. But the recent discovery that the ova of fish can be taken from the body of the female parent, impregnated with the male milt and hatched in tanks, has led to a great extension of the art. One great point in modern pisciculture is the propagation and rearing of young fish in artificial ponds with the view of introducing fish into some locality where they were not previously found. The art has now come into general favor and is widely followed, very many rivers having on their banks breeding and rearing establishments for the purpose of increasing the stock of fish in the streams. The American Fish Commission has successfully introduced into various waters the whitefish, the California trout, the brook char, the shad, and various other fishes, and pisciculture on a large scale is practiced both in the United States and Canada, as also in the leading countries of Europe. The artificial culture of oysters, mussels, lobsters, and other crustacea, is also receiving its due share of attention; so

that altogether the art is every year attaining a greater development, and promises to become an important department of commercial industry. Many millions of young fish are planted yearly, and as a result the evils of over-fishing have been in considerable measure obviated.

Piscidia (pis-sid'i-a), a genus of plants, nat. order Leguminosæ, the species being West Indian trees. The bark of the root of *P. Erythrina* (dogwood tree) is a powerful narcotic, and is used as a substitute for opium, and also for poisoning fish. The timber makes excellent piles for docks and wharfs, being heavy, resinous, and almost imperishable.

Piscina (pi-sī'na), a niche, generally on the south side of the altar in churches, containing or having attached a stone basin or trough, with a channel leading to the ground. It is used to hold the water in which the priest washes his hands, and for rinsing the chalice.

Pise (pē'sā), material for forming the walls of cottages, agricultural buildings, etc., consisting of stiff clayey materials usually mixed with gravel well rammed into a frame, and when dry forming a good strong wall. These walls are thicker at bottom than at top. They must not be built too rapidly.

Pisek (pē-sek'), a town of Bohemia, on the right bank of the Wottawa, 52 miles south by west of Prague. It is surrounded by an old and lofty wall, flanked with numerous towers; is well built, and contains the remains of a royal castle. Pop. 13,608.

Pisidia (pi-sid'i-a), in ancient geography, a province of Asia Minor, situated between Phrygia, Cilicia, Pamphylia, Lycia, and Caria. The inhabitants were mountaineers, and were never really subdued by the Romans, being protected by the mountains and ravines which intersect the country.

Pisistratus (pī-sis'trȧ-tus; Greek, *Peisistratos*), 'tyrant' of Athens, was descended from Codrus, the last king of Athens, and was born not later than 612 B.C. He was rich, handsome, and eloquent, and being by nature ambitious he soon placed himself at the head of one of the three parties into which Attica was then divided. By putting himself forward as the patron and benefactor of the poor, and by advocating civil equality and a democratic constitution, he was able (notwithstanding the opposition of Solon) to seize upon the acropolis (citadel) in 560 B.C., and thus to make himself master, or, as the Greeks termed it, 'tyrant' of the city. But though a tyrant in the Greek sense, his use of power was by no means tyrannical. He made no attempt to abolish the wise laws of Solon, but confirmed and extended their authority. He was, however, twice driven from Athens; but in the eleventh year of his second banishment succeeded in making himself master of the sovereignty for the third time. Pisistratus erected splendid public buildings at Athens, established a public library, and collected and arranged the poems of Homer, and conducted himself with so much prudence and clemency that his country scarcely ever enjoyed a longer term of peace and prosperity. He died 527 B.C., leaving two sons, Hippias and Hipparchus, to inherit his power. They were not, however, able to preserve it. See *Hippias*.

Pi'solite. See *Peastone*.

Pistachio (pis-tā'shi-o), a tree of several species, of the genus *Pistacia*, nat. order Anacardiaceæ, growing to the height of 15 to 20 feet. *P. vera* yields the well-known pistachio-nut, which contains a kernel of a pleasant taste, resembling that of the almond, wholesome and nutritive, yielding a pleasant oil. It is a native of Western Asia, but is much cultivated in the south of Europe. The gum named mastic is obtained from *P. lentiscus*, as well as from *P. Atlantica*. See *Mastic*.

Pistachio (*Pistacia vera*).

Pistil (pis'til), in botany, the female or central seed-bearing organ of a phanerogamous

Pistil. *a*, style; *b* stigma.

flower, consisting of one or more *carpels* or modified leaves. There may be only a single pistil or several in the same flower. It consists essentially of two parts, the *ovary*, containing the ovules or young seeds, and the *stigma*, a cellular secreting body which is either seated immediately on the ovary (as in the tulip and poppy), and is then called *sessile*, or is borne on a stalk called a *style* interposed between the ovary and stigma. It is on the stigma that the pollen falls by which fecundation takes place, after which the ovule develops into the seed. See *Placenta*, *Botany*.

Pistil of Tobacco.

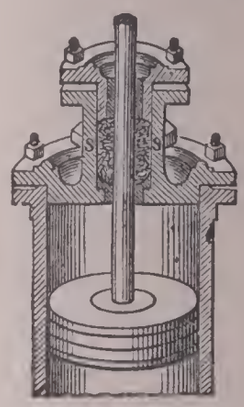
Pistillidium (pis-til-id'i-um), an organ of cryptogamic plants, which seems to have functions analogous to those of the pistil of of a phanerogamous flower. It is the young spore-case.

Pistoja (pis-tō'yȧ; ancient *Pistoria*), a town of Italy, in the province of Florence, and 20 miles northwest of the city of that name, near the left bank of the Ombrone. It is surrounded by lofty walls, contains a Romanesque cathedral (twelfth to thirteenth century) and other notable churches and buildings, and has manufactures of iron and steel goods, firearms, linen, etc. Pistols were first made here, and received their name from the town. Pop. (1911) 67,653.

Pistol (pis'tul), a small firearm with a curved stock, discharged with one hand, named from the town of Pistoja, where it was first made. Pistols were introduced into England in 1521. Mention is made of their use in 1544. The 'dag' mentioned by the Elizabethan writers was a kind of clumsy pistol. Pistols are made of various sizes, ranging from 6 inches (the saloon and pocket pistol) to 18 and even 24 inches (the holster pistol). They have been remarkably developed in effectiveness, and the modern pistol is a formidable weapon in close-hand fighting. See *Revolver*.

Pistole (pis-tōl'), a gold coin met with in several parts of Europe, more especially in Spain, value about $4.00, but not now coined. It was originally a Spanish coin, and was equivalent to a quarter of a doubloon.

Piston (pis'tun), in machinery, a movable piece, generally of a cylindrical form, so fitted as to occupy the sectional area of a tube, such as the barrel of a pump or the cylinder of a steam-engine, and capable of being driven alternately in two directions by pressure on either of its sides. One of its sides is fitted to a rod, called the *piston-rod*, which it either moves backwards and forwards, as in the steam-engine, where the motion given to the piston-rod is communicated to the machinery; or the piston is itself made to move by the rod, as in the pump. The piston is usually made to fit tightly by some kind of material used as *packing*, the piston-rod being also made similarly tight by material closely packed in the *stuffing-box* (*s s*).



Piston and Cylinder.

Pit, in horticulture, the name applied to an excavation below the surface of the soil, generally covered by a glazed frame for protecting plants.

Pita Hemp (pē'ta), a name given to the fiber of the agave or American aloe. See *Aloe*.

Pitaval (pē-tȧ-vȧl), François Gayot de (1673-1743), a French jurist and legal writer, best known for his *Causes Célèbres et Intéressantes*.

Pitcairn (pit'kārn), a borough of Allegheny Co., Pennsylvania, 15 miles E. of Pittsburgh, in a coal-mining district. The large shops and yards of the P. R. R. are here. Pop. 5738.

Pitcairn Island (pit'kârn), an island in the South Pacific, belonging to the Low Archipelago, lat. 25° 5′ S.; lon. 130° 5′ W.; length, 2¼ miles; breadth, about 1 mile. It was discovered by Carteret in 1767. Its coast is almost perpendicular throughout its whole extent, fringed with formidable rocks and reefs, accessible only at two points, and not at all in stormy weather. It rises to the height of 1100 feet, and the soil, naturally fertile, yields good pasture, potatoes, yams, plantain and bread-fruit, pineapples, and other tropical fruits. The island is chiefly remarkable as the home of the descendants of the *Bounty* mutineers, nine of whom, together with six men and twelve women, natives of Tahiti, landed here in 1790. Violent dissensions soon arose and at the end of ten years the only survivors were John Adams, an Englishman (whose real name was said to have been Alexander Smith), the females, and nineteen children. They were found in 1808 by the American, Captain Folger, who reported the dis-

covery to the British government. The interest thus aroused soon brought other visitors to the island, all of whom dilated with enthusiasm on the virtuous, sober, and industrious life led by the inhabitants. They became, however, too numerous to subsist comfortably on this small island, and they were transferred, to the number of 194, to Norfolk Island in 1856, but about 40 soon returned. In 1881 the inhabitants numbered 96, and in 1900, 130. Whalers and trading vessels occasionally call and exchange the products of civilization for the produce of the island. See *Norfolk Island.*

Pitch (pich), the residuum obtained by boiling tar till the volatile matter is driven off. It is extensively used for caulking the seams of ships, for preserving wood and ironwork from the effects of water, for making artificial asphalt, etc.

Pitch, the acuteness or gravity of any particular musical sound, which is determined by the number of air-vibrations in a given time — the greater the number, the higher the note. In stringed instruments the pitch is dependent on the length, thickness, and degree of tension of the string; in wind instruments, such as the flute or organ, chiefly on the length of the column of air set in motion. (See *Music.*) The tuning-fork is in common use to assist in giving some desired pitch.

Pitchblende, a mineral chiefly found in Saxony and Cornwall, composed of 86.5 oxide of uranium, 2.5 black oxide of iron, galena, and silex. In color it varies from brown to black, and occurs globular, reniform, massive, disseminated, and pulverulent. Specific gravity, 7.5. It generally accompanies uranite and is the chief source of the newly discovered element, radium.

Pitcher Plant (pich'ẽr), a name given to several plants from their pitcher-shaped leaves, the best known of which is the *Nepenthes distillatoria,* a native of China and the East Indies, and belonging to the natural order Nepenthaceæ. It is a herbaceous perennial, and grows in marshy situations. The leaves are sessile, oblong, and terminated at the extremities by a cylindrical hollow vessel resembling a common water-pitcher, which contains a fluid secreted by the plant itself. The pitcher is furnished with a lid which generally opens in the day and shuts at night, and which is regarded as the true blade of the leaf. Wonderful curative powers are ascribed to the fluid in the pitcher and to the leaf and the root of this plant, by the natives of the East Indies and Madagascar. There are numerous other pitcher-plants, varying in shape and the proportions of their parts, and found in all parts of the world.

Pitcher-plant (*Nepenthes distillatoria*).

Pitch-pine. See *Pine.*

Pitchstone, a black, glossy, pitch-like volcanic rock. It is found chiefly in the Hebrides, Southern Europe, South America, and Mexico, in veins and in dykes or bosses, sometimes forming whole mountains. Specific gravity, 2.29–2.64.

Pitchurim-beans (pich'u-rim), the name given to the lobes of the drupe of *Nectandra puchury,* a South American species of laurel, used by chocolate makers as a substitute for vanilla.

Pith, the cylindrical or angular column of cellular tissue at or near the center of the stem of a plant, also called the *medulla.* It is not usually continued into the root, but is always directly connected with the terminal bud of the stem.

Pithecanthropus Erectus (pith-e-kan-thrō'pus), the name given to the fossil remains of an animal found in Java in 1891. The portion of a cranium found is midway in size and form between those of man and the gorilla, and the femur is like that of man.

Pitman (pit'man), Benn, brother of Sir Isaac Pitman, born at Trowbridge, England, in 1822; died in 1910. He settled in Cincinnati, Ohio; was a government reporter of state trials, 1862-65, and became an instructor in the University of Cincinnati. He published various text-books of phonography.

Pitman, Sir Isaac, born at Trowbridge, England, in 1813; died in 1897. He was the inventor of the modern system of phonographic shorthand writing, also of one of the best systems of phonotypy. He published a number of works on shorthand.

Pitney, Mahlon, an American jurist, born at Morristown, New Jersey, February 5, 1858. He was a member of Congress, 1895-1899, and of the state senate, 1899-1901; associate justice of the New Jersey supreme court, 1901-1908; and chancellor of the state, 1908-1912. In 1912 he was appointed Associate Justice of the Supreme Court.

Piton-bark, same as *Caribbec-bark.*

Pitt, Earl of Chatham. See *Chatham (William Pitt, Earl of).*

Pitt, WILLIAM, second son of the Earl of Chatham, born in 1759; died in 1806. He possessed a remarkably precocious intellect, but his physical powers were weak. He was educated privately till his fourteenth year, when he entered Cambridge. He was called to the bar in 1780, and entered parliament the following year as member for Appleby. His success in the house was of unparalleled rapidity. He supported Burke's financial reform bill, and spoke in favor of parliamentary reform; became chancellor of the exchequer at twenty-three, under the Earl of Shelburne, and in the following year attained the position of prime minister. Although

William Pitt.— From the statue by Chantrey.

strongly supported by the sovereign, he stood opposed to a large majority of the House of Commons, and a dissolution took place in March, 1786. At the general election which followed the voice of the nation appeared decidedly in his favor, and some of the strongest aristocratical interests in the country were defeated, Pitt himself being returned by the University of Cambridge. His first measure was the passing of his India Bill, establishing the board of control, which was followed by much of that fiscal and financial regulation that gave so much *éclat* to the early period of his administration. The establishment of the delusive scheme of a sinking fund followed in 1786, and his Regency Bill in 1788. The French revolution now broke out, and in 1793 war arose between Great Britain and France, a conflict which brought a heavy responsibility on Pitt, and immense sacrifices and burdens on his country. In 1800 the Irish union was accomplished. In 1801 the opposition of the king to all further concession to the Irish Catholics caused Pitt to resign his post. The Peace of Amiens succeeded, and Pitt for a time supported the Addington administration which concluded it, but afterwards joined the opposition. The new minister, who had renewed the war, unable to maintain his ground, resigned; and in 1804 Pitt resumed his post at the treasury. Returning to power as a war minister, he exerted all the energy of his character to render the contest successful, and found means to engage the two great military powers of Russia and Austria in a new coalition, which was dissolved by the battle of Austerlitz. This event he did not survive long; for his constitution, weakened by persisent gout, rapidly yielded to the joint attack of disease and anxiety. Biographers naturally differ as to his merits as a statesman; some assign him a most exalted place, while others represent him as entirely destitute of great ideas, as a man of expedients instead of principles, as a lover of place and royal favor. It is, however, universally granted that he was a distinguished orator, even amongst the very eminent speakers of that period, and that he was a man of strict personal honor. A public funeral was decreed to his honor by parliament, and a grant of £40,000 to pay his debts.

Pitta. See *Ant-thrush.*

Pittacus (pit'a-kus), one of the so-called seven wise men of Greece, born about B.C. 652; died 569, at Mitylene, on the island of Lesbos. He was highly celebrated as a warrior, a statesman, a philosopher, and a poet. In 589 the citizens raised him to the dictatorship for ten years.

Pittsburg (pitz'burg), a city of Crawford Co., Kansas, 130 miles S. of Kansas City, in the heart of the S. E. Kansas coal fields. Seat of the State Manual Training Normal School. The car shops of the Kansas City Southern R. R. are here. Pop. (1910) 14,755; (1920) 18.052.

Pittsburgh, a city, capital of Allegheny Co., Pennsylvania, in the angle between the Monongahela and the Allegheny rivers where they unite to form the Ohio, 260 miles W. by N. of Philadelphia, and on the Pennsylvania, the Baltimore & Ohio, and six other trunk railroads. It is admirably situated for trade, having ample river and railway connection with the great com-

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"THE POINT"—PITTSBURGH

A picturesque view of the great city on the Allegheny and Monongahela Rivers, described by its Chamber of Commerce as 'the world's workshop.'

mercial emporiums of the East, West, and South, while in the neighborhood there are immense and cheaply-obtainable coal supplies. These exceptional advantages have made Pittsburgh the chief center of the American iron and steel industry; smelting furnaces, foundries, rolling-mills, etc., being numerous and on a very large scale. The pig-iron product is about one-fourth of that of the whole country and the steel product more than one-half. The glass manufactures of Pittsburgh also rank first in importance in the United States; cotton goods, leather, earthenware, white lead, soda, tobacco, beer, and spirits are largely produced; but the chief products are iron and steel, hardware and machinery, electrical appliances, railroad brakes, cars and locomotives, steel bridges, aluminum, glass, coal, and coke. In addition to coal, this city is the center of an extensive petroleum and natural gas field. Pittsburgh consists of the town proper and of several large suburbs, and with those that are on the opposite side of the rivers the connection is kept up by numerous bridges, comprising some very excellent examples on the suspension principle. Of the adjacent places, which, though separately incorporated, were long regarded as suburbs of Pittsburgh, the most important is Allegheny, on the right bank of the Allegheny River, a favorite residence with the wealthier classes. It has now become a corporate part of Pittsburgh and the combined cities possess many fine public buildings and institutions. Among these may be named the Carnegie Library and Institute building (with a large library, music-hall, art gallery and natural history museum), the amply-endowed Carnegie Schools of Technology, the Phipps Conservatory, the United States Arsenal, the University of Pittsburgh, the Pennsylvania College for Women, the Exposition buildings, the Roman Catholic and St. Paul's cathedrals, various municipal buildings and charitable institutions, etc. Pittsburgh occupies the site of a fort called Du Quesne, which was built by the French in 1754. It was afterwards captured by the British, in 1758, and named in honor of William Pitt. Allegheny was joined to it by act of the legislature, sustained by a decision of the United States Supreme Court, in 1907. Its population in 1900 was 321,616; that of Allegheny 129,896; making 451,512. In 1910 the population of the consolidated city totaled 533,905; in 1920, 588,193.

Pittsfield (pitz'fēld), a city, county seat of Berkshire Co., Mass., 151 miles w. of Boston, in the main valley of the Berkshire Hills, the Hoosac range to the east, the Taconic range to the west; altitude, 1037 feet. It has great electrical works, the largest stationery plant in the U. S., textile mills, paper mill machinery mills, silk braid factories, etc., also a government paper mill; here the Liberty bonds were made. Among its notable buildings are the Berkshire County Museum, Berkshire Athenæum, court house, etc. Pop. (1910) 32,121; (1920) 41,751.

Pittston (pitz'tun), a city of Luzerne Co., Pennsylvania, on the Susquehanna River, in the Wyoming Valley, 9 miles N. E. of Wilkes-Barre. Here are extensive anthracite-coal industries, planing, knitting, paper, and silk mills, iron works, cut-glass factory, etc. The St. John's Academy is located here. Pittston is on five railroads and is an important business center. Pop. (1910) 16,267; (1920) 18,497.

Pituitary Body (pi-tū'i-ta-ri), a rounded body of the size of a small bean found in the *sella turcica*, a saddle-shaped cavity of the sphenoid bone in the floor of the cavity of the skull. Its function appears to be related to that of the thyroid gland.

Pityriasis (pit-i-rī'a-sis), a chronic and non-contagious inflammation of the skin, manifesting itself in red spots or patches on which minute scales are produced, thrown off as soon as formed, and as quickly renewed. It may affect any part, and, though seldom, many parts of the body at the same time; but the commonest is the *P. capitis*, on the head, when the scales are popularly known as scurf or dandruff. Mild forms generally yield to warm bathing and a light diet, if persevered in; but more obstinate cases can only be thoroughly cured by a radical change in the system, produced by suitable regimen and treatment.

Piura (pē-ö'rȧ), a town of Northern Peru, capital of province of same name, connected by railway with its port, Payta. Pop. about 12,000.

Pius II (pī'us; ÆNEAS SYLVIUS PICCOLOMINI), pope, born in 1405; died in 1464. He was descended from an illustrious Tuscan family, and studied at the University of Siena. He became secretary to Cardinal Capranica, and the Council of Basel in 1431; to the anti-pope Felix V in 1439, and to Frederick III of Germany in 1442. The emperor sent him as an imperial ambassador to a diet at Ratisbon, and in 1446 to Pope Eugenius IV to negotiate the submission of Germany. He gained the favor of Eugenius, whom he had formerly

opposed, and by his successor was created bishop of Trieste in 1447, and cardinal in 1456. He succeeded Calixtus III as pontiff in 1458. In 1460 he published a bull condemning the doctrine he had in former years so vigorously defended: the superiority of a general council to the pope. Pius II was one of the most learned men of his age, and left some valuable and interesting historical works, orations, and letters.

Pius V (Michele Ghislieri), pope, born in 1504; died in 1572. He was raised to the cardinalate by Paul IV in 1557, appointed inquisitor in Lombardy, then inquisitor-general, and chosen pope in 1565. He chiefly distinguished himself by his zeal for conversion of Protestants and Jews; the bull in *Cœna Domini* was renewed by him, and the authority of the *Index Expurgatorius* enforced. In 1570 he excommunicated Elizabeth of England. He lent his influence and assistance to Charles IX of France against his Protestant subjects, and to the Venetians and Spaniards in their war against the Turks. He was canonized by Clement XI.

Pius VI (Giovanni Angelo Braschi), pope, born at Cesena in 1717; died at Valence in 1799. He held important offices under several pontiffs, was raised to the cardinalate by Clement XIV and succeeded him in 1775. Several beneficent reforms were introduced by him in the finance department; he also improved the Vatican Museum, drained the Pontine marshes, reconstructed the port of Ancona, and embellished Rome. The French revolution, however, hastened the decay of the temporal power of the holy see. In 1791 Avignon and the county of Venaissin were reunited to France; by the treaty of Tolentino (1797) he lost the Romagna, Bologna, and Ferrara; and on the 15th of February, 1798, General Berthier established the Roman republic, deprived the pope of his authority, and conveyed him as a prisoner to France, where he died the following year.

Pius VII (Gregorio Barnaba Chiaramonti), pope, born at Cesena in 1742; died in 1823. At the age of sixteen he was received into the order of Benedictines, served as teacher in several abbeys, and subsequently became professor of philosophy in Parma, and of theology in Rome. Pius VI created him bishop of Tivoli, cardinal and bishop of Imola; and his friendly attitude towards the Cisalpine Republic secured him the favor of France, and the election to the papal chair in 1800. After his accession he aimed at re-establishing the old order of things, and to gain it he tried to conciliate Napoleon by attending his coronation. He aroused the open enmity of the emperor by refusing to be present at the coronation in Milan, and to recognize his brother Joseph as king of Naples; the results being another occupation of Rome by French troops (February 2, 1808), the incorporation of the papal cities, and shortly after of Rome itself, with the Kingdom of Italy, and the arrest of the pope (July 6, 1809) and his confinement in Savona and afterwards at Fontainebleau. In 1814 he was released and restored to the possession of all the papal territories except Avignon and Venaissin in France, and a narrow strip of land beyond the Po. His subsequent government was politically and ecclesiastically of a reactionary character.

Pius IX (Giovanni Maria Mastai Ferretti), pope, born in 1792, was destined for a military career, and on the restoration of Pius VII entered the Guardia Nobile of the Vatican, but soon after adopted the clerical profession. He held various ecclesiastical offices under Leo XII, who appointed him Archbishop of Spoleto in 1827, and to the see of Imola in 1832. Here he acquired much popularity by his liberal tendencies. He further showed his benevolent nature during a mission to Naples at the time of a cholera epidemic, when he sold his plate, furniture, and equipage to relieve the sufferers. Although raised to the cardinalate in 1840, he resided in his diocese until his election to the pontificate in 1846. His accession was signalized by the release of 2000 political prisoners, followed by a complete amnesty; and Italy was to be free and independent under a liberal constitution. But the Italians, who wanted to be free of the Austrians, flocked under the banner of Charles Albert, and Pio Nono, as pontiff, found himself obliged to interfere. Disaster, bloodshed, and anarchy followed, and he had himself to seek safety in flight. A Roman republic was proclaimed (Feb., 1849), with Mazzini at its head. Louis Napoleon, president of the French republic, sent an expedition to Rome, which defeated the Italian patriots under Garibaldi, and occupied the city (July 3). The pope returned in April, 1850, but he left the direction of state affairs principally in the hands of his secretary of state, Cardinal Antonelli. On the death of that distinguished prelate, Pio Nono again bestowed his whole attention on the church. He recalled the Jesuits, canonized saints, countenanced miracles, and

defined new dogmas. The immaculate conception of the Virgin was settled by a papal decree in 1854, and the dogma of papal infallibility was established by the ecumenical council of 1870. By this time the pope's dominions had been greatly reduced, and what remained of the temporal power was secured by the presence of French troops at Rome. But the downfall of Napoleon III caused their withdrawal; the Italian troops took possession, and the political rule of the holy see was at an end. The Vatican was left to the pope, and his independence insured. The later years of his 'captivity' were cheered by the proofs of reverence displayed by Roman Catholic Christianity, which accorded him magnificent ovations as his period of jubilee began to fall due. The twenty-fifth anniversary of his pontificate was celebrated with great splendor in 1871; for he was the first pope to reach the traditional 'years of Peter.' He died in February, 1878.

Pius X (Giuseppe Sarto), pope, was born of humble parents at Riese, near Venice, in 1835. He studied at Treviso and Padua and was ordained priest in 1858, being soon after made chancellor of the diocese and vicar of the chapter of Treviso. Leo XIII appointed him bishop of Mantua in 1884, and cardinal and patriarch of Venice in 1893. His simplicity of life, stern repression of abuses, and sympathy with the poor endeared him to the people, and on the death of Leo XIII he was elected pope, Aug. 4, 1903. In 1907 he issued his famous encyclical, *Pascendi*, condemning modernism. He died August 20, 1914, shortly after the outbreak of the war.

Pius XI (Achille Ratti), pope, was born at Desio, Lombardy, Italy, in 1857. He was ordained priest in 1879, and in 1882 became a professor in the Milan Theological Seminary. In 1913 he was sent to the Apostolic Vatican Library in Rome as prefect, remaining there until April, 1918, when he was named the Church's ambassador to Poland. In 1920 he was made Cardinal and Archbishop of Milan, a diocese of great importance. On February 6, 1922, he was elected pope, succeeding the late Benedict XV.

Piute, or Paiute (pī-ūt) Indians, the name of a small tribe of southwestern Utah, but generally given to a number of Shoshone tribes of Utah, Nevada, Arizona and southeast California.

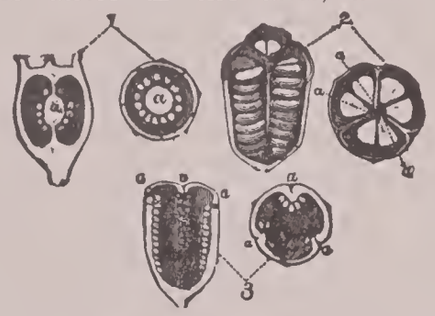
Pizarro (pē-zar'ō), Francisco, a Spanish adventurer, the discoverer and conqueror of Peru, was born in 1471, the illegitimate son of a Spanish officer, under whom he served as a soldier. The spirit of adventure which at that time pervaded Spain prompted him to seek fortune in the newly-found continent of America, where he participated in various military and trading expeditions. While resident near Panama he became associated with two other adventurers, Hernando Lugue, or de Lugues, and Diego de Almagro. In 1524 they jointly fitted out an expedition with a view to exploration and conquest, and on their second voyage discovered Peru; but finding their force inadequate for conquering the country, Pizarro returned to Spain for assistance. He arrived in Seville in 1528, was granted the necessary powers and a small force, and recrossed the Atlantic in 1531. The following year he arrived in Peru during a civil war, treacherously seized the person of the reigning inca at a friendly interview, and after extorting an immense ransom, put him to death. The whole empire was gradually conquered without much opposition, but its settlement was long in abeyance owing to a feud between Pizarro and Almagro. Hernando Pizarro, a brother of the general, strangled Almagro in 1537. This act was avenged in 1541, when a son of Almagro murdered Francisco Pizarro in his palace at Lima. Lima was founded by Pizarro in 1535, and his remains are interred in the cathedral of that city, also founded by him.

Pizarro, Gonzalo, half-brother of the preceding, was born in 1502. His brother appointed him governor of Quito in 1540, and after the assassination of Francisco, he raised an army against the new viceroy, Blasco Nuñez, and the latter was defeated and slain near Quito in 1546. But Pizarro did not long enjoy his success, being beaten, taken prisoner, and beheaded in 1548.

Placenta (pla-sen'ta), the structure which, in the higher Mammalia, connects the fœtus, or unborn embryo, with the circulation of the mother, thus providing for its due nutrition. In its most typical form it is only met with in the higher Mammalia, which are therefore called *placental* mammals, while the lower Mammalia are termed *implacental* or *aplucental*, from their wanting a placenta; the latter include only the two orders Monotremata and Marsupialia. Certain analogous structures also exist in connection with the development of the young of some species of sharks and dogfishes. The human placenta presents the most perfect type, and is a special growth on the part both of the womb and the ovum. By the end of pregnancy it forms a disk-like mass, measuring 7½

inches across, ¾ inch thick, and about 20 oz. in weight. Connected with it near the middle is the umbilical cord, by means of which the growing embryo is attached to the placenta. Through the placenta and the umbilical cord the blood of the embryo comes into close communication with the blood of the mother, by means of which its purity and nourishing qualities are maintained, and the requisite supply of material furnished for the embryo's continued life and growth. At the end of pregnancy the placenta is thrown off as the after-birth, after the child itself has been expelled.

Placenta, in botany, a development of cellular tissue at the inner or ventral suture of a carpel, to which the ovules or seeds are attached either immediately or by umbilical cords, as in the pod of the pea. The placenta is formed on each margin of the carpel, and is therefore essentially double. When the pistil is formed by one carpel the inner margins unite in the axis, and usually



Transverse and Vertical Sections to show Placenta.

1, Central Placenta. 2, Axile central Placenta. 3, Parietal Placenta. *a a*, Placentæ.

form a common placenta. When the pistil is composed of several carpels there are generally separate placentas at each of their margins. The term *parictal placenta* is applied to one not projecting far inwards, or one essentially constituted of the wall of the seed-vessel. The form of placentation forms an important distinction between the various orders of plants.

Placentalia (pla-sen-tā'li-a), the placental mammals. See *Placenta.*

Placentia. See *Piacenza.*

Placentitis (pla-sen-tī'tis), inflammation of the placenta, a disease which occurs acute or chronic, more frequently the latter. It may result from a blow, fall, fright, sudden and violent emotion, and other serious shocks to the system. The fœtus is injuriously affected, and may be destroyed by it; abortion frequently results, and at almost any stage of pregnancy.

Placoid (plak'oid), a term used to designate a variety of scales covering the bodies of the Elasmobranchiate fishes (sharks, skates, rays, etc.), the *Placoidci* of Agassiz. These structures consist of detached bony grains, tubercles, or plates, of which the latter are not uncommonly armed with spines.

Plagal (plā'gal), in music, the name given by Gregory the Great to the four collateral scales which he added to the four authentic scales of Ambrose. (See *Gregorian Tones.*) The term plagal is now applied to melodies in which the principal notes lie between the fifth of the key and its octave. The plagal cadence consists of the chord of the subdominant followed by that of the tonic. See *Music.*

Plagiostomi (pla-gi-os'to-mi; Gr. *plagios*, oblique; *stoma*, mouth), a suborder of fishes of the order Elasmobranchii, distinguished by the bodies of the vertebræ being either bony or at any rate containing osseous elements; the skull gristly or cartilaginous; the mouth a transverse slit, situated on the under surface of the head; and the teeth numerous. The Plagiostomi include three groups: the Cestraphori, represented solely by the *Cestracion Phillipi* or Port-Jackson shark; the Selachii (sharks and dogfishes); and the Batides, represented by the skates, rays, and sawfishes.

Plagium (plā'ji-um), in the Roman law, is the crime of stealing the slave of another, or of kidnaping a free person in order to make him a slave. By Scotch law the crime of stealing an adult person (*plagii crimen*) was punishable with death, and the same punishment has been applied to the stealing of children.

Plague (plāg), a contagious and very fatal febrile disease characterized by entire prostration of strength, stupor, delirium, often nausea and vomiting, and certain local symptoms, as buboes, carbuncles, and livid spots (*petechiæ*). Like all other malignant fevers, the plague has its various stages, but most frequently runs its course in three days, although death may ensue a few hours after its appearance. If the patient survive the fifth day, he will, under judicious treatment, generally recover. There is no specific remedy against the disease, and a variety of treatment has been adopted on different occasions and by different medical men. The plague appeared in the most ancient times, although historians have used the terms indiscriminately for other epidemics. The first recorded visitation of the

plague to Europe is that at Athens (430 B.C.), described by Thucydides; Josephus relates that of Jerusalem, A.D. 72. Among the most disastrous plagues of antiquity are those of Rome in 262, when 5000 persons are said to have died daily; and of Constantinople in 544. From the latter part of the sixth to the twelfth century it ravaged at intervals various parts of Europe, particularly France and Germany. In the thirteenth century it was brought to modern Europe by the Crusaders, and from 1347 to 1350 it traversed all Europe, and was then called the *black death*. The scourge again claimed its victims in the succeeding centuries, and in 1593 it was brought to England by an army returning from the Continent. Before the true nature of the disease became known it had gained a firm footing in London, and there were 11,503 deaths. London lost by the plague 36,269 lives in 1603; 35,500 in 1625; 13,480 in 1636; and 68,600 in 1665. The plague in Marseilles in 1720 caused the death of over 60,000 in seven months, and in Messina (1743) of 43,000 in three months. In 1771 it nearly swept off the whole population of Moscow. Subsequently it appeared locally in Europe at a number of points. Its last appearance in Europe was in 1878–79, on the banks of the Lower Volga (Astrakhan and neighborhood). An epidemic of plague broke out in the Bombay Presidency, India, in 1896. In 1900 it appeared in Australia, New Zealand, and the Philippines, and even reached California. A few cases made their appearance in Porto Rico in 1912. The disease is attributed to a micro-organism, the *Bacillus pestis*, discovered in 1894 by Kitasato and by Yersin. Rats are especially subject to the infection, and fleas convey it from rats to men.

Plaice (plās; *Pleuronectes* or *Platessa*), a genus of so-called 'Flat-fishes.' The common plaice (*Pleuronectes platessa* or *Platessa vulgāris*), a well-known food fish, attains an average length of 12 or 18 inches. The dark or upper side is colored brown, spotted with red or orange; the body is comparatively smooth; the ventral fins are situated on the throat, and are thus jugular in position; the mouth is of small size, and provided with small teeth. These fishes are all 'ground-fishes,' that is, feed and swim near the bottom of the sea. They are caught chiefly by means of trawl-nets.

Plain (plān), a tract of country of nearly uniform elevation; known also as *steppes*, *savannas*, *prairies*, *pampas*. Elevated plains are called *plateaus* or *tablelands*.

Plainfield (plān'fēld), a city of Union Co., New Jersey, at the base of the Watchung Mountains, 24 miles W. S. W. of New York. It has printing press, tool, automobile and searchlight industries; and is a residential city for many New York business men. Pop. (1920) 27,700.

Plainfield, a town of Windham Co., Connecticut, in Plainfield township (town), 16 miles N. N. E. of Norwich, on the New York, New Haven & Hartford railroad. The town has manufactures of cottons, woolens, yarns, etc. Pop. (1920) 7926.

Plain-song, the name given to the old ecclesiastical chant in its most simple state, and without harmonic appendages. It consists largely of monotone, and its inflections seldom exceed the range of an octave. Ambrose of Milan and Gregory the Great introduced certain reforms into the church music of their day, regarding which see *Gregorian Tones*.

Plaintiff (plān'tif), in law courts, the person who commences a suit against another in law or equity.

Plan, in architecture, a drawing showing the design of a building, a term chiefly used in reference to horizontal sections showing the disposition of the walls and various floors of the building, and of the doors and windows etc.; but also applied to elevations and vertical sections. A *geometrical plan* is one wherein the several parts are represented in their true proportions. A *perspective plan* is one, the lines of which follow the rules of perspective, thus reducing the sizes of the more distant parts. The term is also applied to the draught or representation on paper of any projected work, as the *plan* of a city or of a harbor.

Planarida (plan-ar'i-da), the Planarians, a suborder of flat, soft-bodied annelids, of the order Turbellaria, mostly oval or elliptical in shape, and not unlike the foot of a gasteropodous mollusc. They are, for the most part, aquatic in their habits, occurring in fresh water or on the seashore, but are found occasionally in moist earth. The male and female organs are united in the same individual, and the process of reproduction may be either sexual, by means of true ova, or non-sexual, by internal gemmation or transverse fission.

Planché (plang'shā), JAMES ROBINSON, an English dramatist

and miscellaneous writer, was born in 1796; died in 1880. He came forward early as a writer of pieces for the theater, and also occupied himself with archæology, heraldry, etc., being appointed a pursuivant in the Heralds' college, and latterly Somerset herald (1866). He wrote a vast number of extravaganzas, pantomimes, and other light pieces, while among his more serious productions were: *History of British Costume; Introduction to Heraldry; The Pursuivant at Arms*, a treatise on heraldry; *Recollections and Reflections; The Conqueror and his Companions; The Cyclopædia of Costume.*

Planchette (plan-shet'), an instrument used in spiritualistic *séances*. It consists of a heart-shaped board, with wheels under its broad end, and a hole at the pointed end through which a pencil may be thrust. It moves readily when the fingers of sensitives are placed on it, and often writes freely, many long and often very curious communications being thus received.

Plane (plān), a joiner's tool, consisting of a smooth-soled solid block, through which passes obliquely a piece of edged steel forming a kind of chisel, used in paring or smoothing boards or wood of any kind. Planes are of various kinds, as the *jack plane* (about 17 inches long), used for taking off the roughest and most prominent parts of the wood; the *trying plane*, which is used after the jack plane; the *smoothing plane* (7½ inches long) and *block plane* (12 inches long), chiefly used for cleaning off finished work, and giving the utmost degree of smoothness to the surface of the wood; the *compass plane*, which has its under surface convex, its use being to form a concave cylindrical surface. There is also a species of plane called a *rebate plane*, being chiefly used for making rebates. The *plough* is a plane for sinking a channel or groove in a surface, not close to the edge of it. *Molding planes* are for forming moldings, and must vary according to the design. Planes are also used for smoothing metal, and are wrought by machinery. See *Planing Machine.*

Plane, in geometry, a surface such that if any two points in it are joined by a straight line the line will lie wholly within the surface.

Plane, INCLINED. See *Inclined Plane.*

Plane-tree (*Platănus*), a genus of trees, natural order Platanaceæ. *P. occidentālis*, the American plane-tree or buttonwood (the *sycamore* or *cotton-tree* of the West), abounds in American forests, and on the banks of the Ohio attains sometimes a diameter of from 10 to 14 feet, rising 60 or 70 feet without a branch. The bark is pale green and smooth, and its epidermis detaches in portions; the fresh roots are a beautiful red; the leaves are alternate, palmated, or lobed; and the flowers are united in little globular, pendant balls. The wood in seasoning takes a dull red color, is fine grained, and susceptible of

Oriental Plane-tree (*Platanus orientālis*).

a good polish, but speedily decays on exposure to the weather. The oriental (*P. orientālis*), resembles the preceding, and is plentiful in the forests of Western Asia. The *P. orientālis* and *P. acerifolia*, from being able to withstand the deleterious influences of a smoky atmosphere, are among the trees most suitable for planting in towns. The *Acer Pseudoplatănus*, the common sycamore or greater maple, is called in Scotland the plane-tree.

Planet (plan'et), a celestial body which revolves about the sun as its center (*primary planets*), or a body revolving about another planet as its center (*secondary planets, satellites*, or *moons*). The known *major* planets are, in the order of their proximity to the sun, Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. Mercury, Venus, Mars, Jupiter, and Saturn were known to the ancients. Uranus was accidentally discovered by Herschel in 1781, while the discovery of Neptune was the result of pure intellectual work, the calculating of Leverrier and Adams (1845). The planetoids or asteroids are small bodies discovered since the beginning of the nineteenth century between the orbits of Mars and Jupiter. The number of these asteroids

is annually increased by fresh discoveries; over 700 are now known. Mercury, Venus, the Earth, and Mars closely resemble each other in many respects. They are all of moderate size, with great densities; the earth weighing as much as five and a half times an equal bulk of water. They shine only by reflected sunlight. Jupiter, Saturn, Uranus, and Neptune, on the other hand, are of enormous size, of small densities, some of them weighing less than an equal bulk of water, and probably exist at a high temperature, and give out in addition to reflected sunlight a considerable amount of light and heat of their own. Nearly all the planets are attended by moons, varying from one to ten in number. The most colossal of the planets is Jupiter; its volume exceeds that of the earth about 1200 times. Saturn is next in size. Mars, Jupiter, Saturn, Uranus, and Neptune, being outside the earth's orbit, are sometimes called the *superior planets;* Venus and Mercury, being within the earth's orbit, are called *inferior planets.* The family of major planets has also been subdivided into *intra-asteroidal* planets — Mercury, Venus, the Earth, Mars; and *extra-asteroidal* planets — Jupiter, Saturn, Uranus, and Neptune, the character of the two being very different as above described. The planet which approaches nearest to the earth is Venus, the least distance in round numbers being 23 millions of miles; the most distant is Neptune, least distance 2629 million miles. We give here a comparative table of the planets; see also the separate articles.

	Mean Distance from the Sun.	Distance from the Earth.		Time of Revolution round the Sun.	Time of Rotation on Axis.
		Greatest.	Least.		
	Miles.	Miles.	Miles.	Mean Solar Days.	h. m. s.
Mercury ..	35,393,000	135,631,000	47,229,000	87·9692	?
Venus ...	66,131.000	159,551,000	23,309,000	224·7007	23 16 19?
The Earth.	91,430,000	....	....	365·2563	23 56 4
Mars	139,312,000	245,249,000	62,3[illegible]9,000	686·9794	24 37 23
Jupiter ...	475,693,000	591,569,000	408.709,000	4332·5848	9 55 28
Saturn ...	872,135,000	1,014,071,000	831.210,000	10759·2197	10 29 17
Uranus ...	1,753,851.000	1,928,666,000	1,745.806,000	30686·8205	?
Neptune ..	2,746,271,000	2,863,183,000	2,629,360,000	60126·722	?

Planetarium. See *Orrery.*

Planimeter (plā-nim'e-tėr), an instrument by means of which the area of a plane figure may be measured. It is employed by surveyors in finding areas on maps, etc.

Planing Machine, a machine tool for planing wood or metal. For the former purpose the usual form has cutters on a drum rotating on a horizontal axis over the board which is made to travel underneath. The cutter-drum may be repeated underneath and at the edges, so as to plane all sides simultaneously. In planing metals the object to be planed, fixed on a traversing table, is moved against a relatively fixed cutter, which has a narrow point and removes only a fine strip at each cut.

Plankton (plank'tun), a name given to the small animals of the ocean or other waters, taken collectively.

Plant. See *Botany.*

Plantagenet (plan-taj'e-net), a surname first adopted by Geoffrey, Count of Anjou, and said to have originated from his wearing a branch of broom (*plante de genêt*) in his cap. This name was borne by the fourteen kings, from Henry II to Richard III, who occupied the English throne from 1154–1485. In 1400 the family was divided into the branches of Lancaster (Red Rose) and York (White Rose), and from their reunion in 1485 sprang the House of Tudor. See *England.*

Plantagineæ (plan-ta-jin'e-ē), or PLANTAGINA'CEÆ, the plantains, a small nat. order of plants belonging to the monopetalous exogenous series. It consists of herbaceous, rarely suffrutescent, plants, with alternate or radical, rarely opposite, leaves, and inconspicuous flowers on scapes arising from the lower leaves. The rib-grass or ribwort (*Plantāgo lanceolāta*), the root and leaves of which were formerly used in medicine as astringents, is a common type found all over Europe. See also next article.

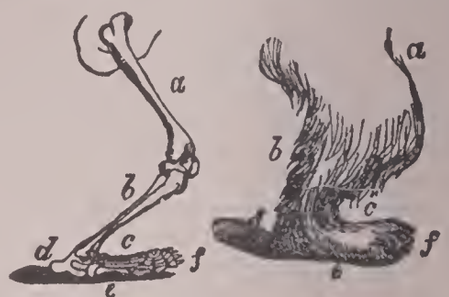
Plantain (plan′tān; *Plantāgo major*), or GREAT PLANTAIN, a common weed, the leaves of which are all radical, oval, and petiolate, and from amongst them arise several long cylindrical spikes of greenish, inconspicuous flowers. The root and seed are still occasionally employed in the treatment of diarrhœa, dysentery, and external sores; the seeds are also collected for the food of birds.— The name is also given to an entirely different plant. See next article.

Plantain, PLANTAIN-TREE, the type of the nat. order Musaceæ. *Musa paradisiăca*, a native of the East Indies, is cultivated in mostly all tropical countries. The stem is soft, herbaceous, 15 to 20 feet high, with leaves often more than 6 feet long and nearly 2 broad. The fruit grows in clusters, is about 1 inch in diameter and 8 or 9 inches long. The stem dies down after fruiting; but the root-stock is perennial, and sends up numerous fresh shoots annually. It is easily propagated by suckers. The banana (which see) is a closely-allied variety or species. Their fruits are among the most useful in the vegetable kingdom, and form the entire sustenance of many of the inhabitants of tropical climates. A dwarf variety, *M. chinensis*, produces a fruit in European hothouses. The fibers of the leaf-stalks of *M. textilis* of the Philippine Islands supplies Manila hemp or abaca, from which cordage of the strongest character is made, the finer fibers being used in making cloth.

Plantain-eaters, a group of perching birds, family Musophagidæ. The genus *Musophăga* of tropical Africa includes the most typical forms. These birds chiefly feed upon the fruit of the banana and plantain-tree. The base of the bill appears as a broad plate covering the forehead. The plumage exhibits brilliant coloration. The members of the genus *Corythaix* or *Touracos* possess a bill of ordinary size and conformation, and feed on insects in addition to fruits.

Plantation (plan-tā′shun), a term formerly used to designate a colony. The term was later applied to an estate or tract of land in the Southern States of America, the West Indies, etc., cultivated chiefly by negroes or other non-European laborers. In the Southern States the term *planter* is specially applied to one who grows cotton, sugar, rice, or tobacco.

Pantigrada (plan-ti-grā′da), PLANTIGRADES, carnivorous animals in which the whole or nearly the whole sole of the foot is applied to the ground in walking. This section includes the bears, raccoons, coatis, and badgers. Carnivora which, like the



Plantigrada — Foot of Polar Bear.
a, Femur or thigh. *b*, Tibia or leg. *c*, Tarsus or foot. *d*, Calx or heel. *e*, Planta or sole of foot. *f*, Digiti or toes.

weasels and civets, use only part of the sole in walking, are termed *semiplantigrada.*

Plant-lice. See *Aphis.*

Plasencia (pla-sān′thi-a), a walled town in Spain, Estremadura, almost surrounded by the river Yerte, 120 miles W. S. W. of Madrid. Its cathedral, episcopal palace, and ruined towers are the chief objects of interest. Pop. 7965.

Plasma (plas′ma), a siliceous mineral of a green color, which, especially in ancient times, was used for ornamental purposes.

Plassey (pläs′sē), a village in Bengal, on the Hooghly, 80 miles north of Calcutta. Here on June 23, 1757, Colonel, afterwards Lord Clive, with 900 Europeans and 2100 sepoys, defeated Suraja Dowla with an army consisting of 50,000 foot and 18,000 horse, and laid the foundation of the British Empire in India.

Plastering (plas′tėr-ing) is the art of covering the surface of masonry or woodwork with a plastic material in order to give it a smooth and uniform surface, and generally in interiors to fit it for painting or decorations. In plastering the interior of houses a first coat is generally laid on of lime, thoroughly slaked, so as to be free from any tendency to contract moisture, and mixed with sand and cows' hair. For the purpose of receiving this coat the wall is generally first covered with laths or thin strips of wood, with narrow interstices between. The face of the first coat, which should be of considerable thickness, is troweled, or indented with cross lines by the trowel, to form a key for the finishing coats. The second coat is applied to this when it it thoroughly

dried. It is rubbed in with a flat board so as thoroughly to fill the indentations and cover the unequal surface of the first coat with a smooth and even one. In plastering walls great care must be taken to have the surface perfectly vertical. The setting coat, which is of pure lime, or for moldings or finer work of plaster of Paris or stucco, is applied to the second coat before it is quite dry. A thin coating of plaster of Paris is frequently applied to ceilings after the setting coat.

Plaster of Paris, the name given to gypsum (which see) when ground and used for taking casts, etc. If one part of powdered gypsum be mixed with two and a half parts of water a thin pulp is formed, which after a time sets to a hard, compact mass. By adding a small quantity of lime to the moistened gypsum a very hard marble-like substance is obtained on setting.

Plasters are applications of local remedies to any part of the surface of the body by means of a supporting texture of leather, silk or other cloth, or merely of paper. Plasters may be intended to give protection, support, or warmth, or they may be actively medicinal. (See *Blisters.*) The materials most frequently used in plasters are belladonna, cantharides, galbanum, isinglass, lead, mercury, opium, pitch, resin, iron, and soap, and their adhesive property is generally due to the combination of oxide of lead with fatty acids.

Plastic Clay, in geology, a name given to one of the beds of the Eocene period from its being used in the manufacture of pottery. It is a marine deposit.

Plata, La, United Provinces of. See *Argentine Republic.*

Plata (plä'tà), Rio de la (*River of Silver*), or River Plate, runs for more than 200 miles between the Argentine Republic and Uruguay, and is not, strictly speaking, a river, but rather an estuary, formed by the junction of the great rivers Paraná and Uruguay (which see). It flows into the Atlantic between Cape St. Antonio and Cape St. Mary, and has here a width of 170 miles. On its banks are the cities and ports of Montevideo and Buenos Ayres. Navigation is hampered in some parts of the river by shallow water and sand banks. It was discovered in 1515 by Juan Diaz de Solis, and called Rio de Solis; it owes its present name to the famous navigator Cabot.

Platæa (pla-tē'a), a city of ancient Greece, in Bœotia, now wholly in ruins. It has a permanent place in history on account of the great battle which was fought in its vicinity in September, 479 B.C., when 100,000 Greeks under Pausanias defeated about thrice that number of Persians under Mardonius.

Plata'lea. See *Spoonbill.*

Platanista (pla-tan-is'ta), a fresh-water dolphin, differing chiefly from the true Delphinidæ in its blowhole being a longitudinal instead of transverse fissure. It is represented by a single species (*P. Gangetica*), which inhabits the estuary of the Ganges. An allied form (*Inia Boliviensis*) inhabits the rivers of Bolivia.

Platanus (plat'a-nus), the plane-tree genus, type of the order Platanaceæ, which consists of this one genus. See *Plane-tree.*

Plate. See *Plate-marks.*

Plateau (pla-tō'). See *Tableland.*

Plate Glass. See *Glass.*

Plate-marks, or Hall-marks, in Britain, a series of marks: hall-mark, sovereign's mark, name-mark (first letter of Christian and surname of maker), and date mark (a variable letter), legally stamped upon gold and silver plate as an index to quality, name of maker, date and place of manufacture. The duty of assaying and stamping gold and silver wares is performed by the Goldsmiths' Company of London. Their marks are a leopard's head crowned, and a lion passant as the sovereign's mark. Affiliated with Goldsmiths' Hall are the following assay offices, each of them having a distinctive mark: Birmingham, an anchor; Chester, three garbs (or sheaves) and a dagger; Exeter, a castle with three towers; Newcastle, three castles; Sheffield, a crown; Edinburgh, a thistle; Glasgow, tree, fish, and bell; Dublin, a harp, crowned. Plate, whether of British or foreign make (the latter bears in addition to the usual marks the letter F in an oval escutcheon), must be of one of the standards prescribed by law, and hall-marked, before it can be dealt in, or even exposed for sale. Forfeiture and a fine of £10 for each article are the penalties attached to breaches of this law. The standards are: gold, 22, 18, 15, 12, and 9 carats (24 carats=pure gold); silver, almost invariably 11 ozs. 2 dwts. per lb. troy. Foreign plate of an ornamental character manufactured before 1800, jewelry with stone settings or so richly chased that it could not be stamped without injury, silver chains, necklets, and

lockets, and a variety of small fancy articles are exempt from hall-marking. Gold plate is liable to a duty of 17*s.* per oz., silver plate 1*s.* 6*d.* per oz.; this duty is payable at the assay offices before the assayed and stamped goods are returned. A rebate of $\frac{1}{8}$th in gross weight is allowed if articles are sent in an unfinished state. All *plain* rings, of whatever weight, are considered as *wedding* rings, and liable to duty, while rings chased or jeweled are free. For dealing in plate of gold above 2 dwts. and under 2 ozs. in weight, or of silver above 5 dwts. and under 30 ozs. per article, a plate license of £2, 6*s.* (renewable annually) is required; for heavier wares the amount of annual license is £5, 15*s.*

Plate-powder, a fine powder for cleaning gold and silver plate, commonly made of a mixture of rouge and prepared chalk.

Plating (plāt'ing), the coating of a metallic article with a thin film of some other metal, especially gold or silver. As regards plating with precious metals, electrodeposition has entirely superseded the old Sheffield method, which consisted in welding plates of various metals at high temperatures. This welding process is now, however, largely employed in plating iron with nickel for cooking vessels, iron with brass for stair-rods and other furnishing and domestic requisites, and lead with tin for pipes, etc. See *Electro-metallurgy.*

Platinum (plat'in-um), a metal discovered in America in the 16th century. Platinum occurs mostly in small, irregular grains, generally contains a little iron, and is accompanied besides by iridium, osmium, rhodium, palladium, ruthenium (hence called the 'platinum metals'), and also sometimes by copper, chromium, and titanium. It was first obtained in Peru, and has since been found in various other localities, such as Canada, Oregon, California, the West Indies, Brazil, Colombia, Borneo, etc., but the chief supply of platinum ore comes from the Ural Mountains in Siberia. It was there discovered in beds of auriferous sands in 1823, and has been worked by the Russian government since 1828. Pure platinum is almost as white as silver, takes a brilliant polish, and is highly ductile and malleable. It is the heaviest of the ordinary metals, and the least expansive when heated; specific gravity 21.53 rolled, 21.15 cast. It undergoes no change from the combined agency of air and moisture, and it may be exposed to the strongest heat of a smith's forge without suffering either oxidation or fusion. Platinum is not attacked by any of the pure acids. Its only solvents are chlorine and nitro-muriatic acid, which act upon it with greater difficulty than on gold. In a finely divided state it has the power of absorbing and condensing large quantities of gases. On account of its great infusibility, and its power generally of withstanding the action of chemical reagents, platinum is much used as a material for making vessels to be used in the chemical laboratory. As a platinum loop or needle it is much used in bacteriological laboratories. Crucibles, evaporating dishes, etc., are very often made of platinum; so also the large stills used for the evaporation of sulphuric acid. The useful alloys of platinum are not numerous. With silver it forms a tolerably fusible white alloy, malleable and brilliant when polished; but it scales and blackens by working. Gold, by a forge heat, combines with platinum, and the alloys, in all proportions, are more fusible than the latter metal. In the proportion of 38 grs. to 1 oz. it forms a yellowish-white, ductile, hard alloy, which is so elastic after hammering that it has been used for watch-springs; but the favorable results expected from them have not been realized. Alloyed with iridium (a rare metal of the same group) it possesses an excellent and unalterable surface for fine engraving, as in the scales of astronomical instruments, etc. This alloy has also been adopted for the construction of international standards of length and weight. Mercury, by trituration with spongy platinum, forms an amalgam at first soft, but which soon becomes firm, and has been much used in obtaining malleable platinum. A coating of platinum can be given to copper and other metals by applying to them an amalgam of spongy platinum and 5 parts of mercury; the latter metal is then volatilized by heat. Lead combines with platinum readily; and iron and copper in like manner. The last mentioned, when added in the proportion of 7 to 16 of platinum and 1 of zinc, and fused in a crucible under charcoal powder, forms the alloy called artificial gold. Steel unites with platinum in all proportions, and, especially in the proportion of from 1 to 3 per cent. of platinum, forms a tough and tenacious alloy, well adapted for cutting instruments. Arsenic unites easily with platinum, and is sometimes employed for rendering the latter metal fusible. An alloy of platinum, iridium, and rhodium is used for making crucibles, etc. It is harder than pure platinum, is less easily attacked by chemical reagents, and bears a higher temperature without fusing.

Plato (plā'tō), an ancient Greek philosopher, founder of one of the great schools of Greek philosophy, was born at Athens in B.C. 429; died in B.C. 347. Few particulars of his life are known, but it is beyond doubt that he was well connected and carefully educated. About his twentieth year he came directly under the influence of Socrates, and from this time he gave himself entirely to philosophy. Until the death of Socrates (B.C. 399) he appears to have been his constant and favorite pupil; but after that event Plato is supposed to have left Athens with a view to improving his mind by travel. He is said to have visited Cyrene (in North Africa), Lower Italy, and Sicily. Various other journeys are attributed to him, but without sufficient authority. About B.C. 389 or 388 Plato returned to Athens and began to teach his philosophical system in a gymnasium known as the Academy, his subsequent life being unbroken, except by two visits to Sicily. He appears to have had a patrimony sufficient for his wants, and taught without remuneration. One of his pupils was Aristotle.

Plato.— Antique gem.

The reputed works of Plato consist of *Dialogues* and *Letters*, the latter now regarded as spurious; but the genuineness of most of the *Dialogues* is generally admitted. The chronology of the latter is a matter of uncertainty. The first attempt at a critical arrangement was made by Schleiermacher, who adopted an arrangement into three divisions, according to the leading doctrines he believed they were intended to inculcate. The chief works in the first section are Phædrus, Protagoras, Parmenides, Lysis, Laches, Charmides, Euthyphron; in the second, Theætetus, Sophistes, Politicus, Phædo, Philebus, Gorgias, Meno, Euthydemus, Cratylus, Symposium; in the third, the Republic, Timæus, Critias, and the Leges or Laws. Hermann has attempted to make out a chronological arrangement, and other scholars who differ from Schleiermacher have attempted various theories of constructive arrangement. These schemes in general proceed on the assumption that each dialogue, being an artistic whole, forms a link in a chain. Grote and others, however, do not admit that Plato followed any plan either artistic or didactic. Apart from their philosophical teaching the dialogues of Plato are admirable as works of literature, especially for their dramatic truthfulness, and exhibit Greek prose in its highest perfection. In all of them Socrates (idealized) appears as one of the speakers. They contain also lively and accurate accounts of previous systems of Greek philosophy and their teachers, introduced not merely for historical purposes, but as incidental to the analysis of their opinions. There is an excellent English translation of the whole by Jowett.

The philosophy of Plato must be regarded as one of the grandest efforts ever made by the human mind to compass the problem of life. After the example of Socrates, he held the great end of philosophic teaching to be to lead the mind of the inquirer to the discovery of truth rather than to impart it dogmatically, and for this end he held oral teaching to be superior to writing. This preference appears to have determined the conversational form given to most of his works. Plato originated the distinction of philosophy into the three branches of ethics, physics, and dialectics, although these names were first applied by his disciple Xenocrates. The cardinal principle of Plato's dialectical system is the doctrine of ideas. True science, according to him, was conversant, not about those material forms and imperfect intelligences which we meet with in our daily intercourse with men; but it investigated the nature of those purer and more perfect patterns which were the models after which all created beings were formed. These perfect types he supposes to have existed from all eternity, and he calls them the *ideas* of the great original Intelligence. As these cannot be perceived by the human senses, whatever knowledge we derive from that source is unsatisfactory and uncertain. Plato, therefore, maintains that degree of skepticism which denies all permanent authority to the evidence of sense. Having discovered or created the realm of ideas, he surveyed it throughout. He defined its most excellent forms as beauty, justice, and virtue, and having done so he determined what was the supreme and dominant principle of the whole. It is the idea of the Good. The harmony of intelligence throughout its entire extent with goodness: this is the highest attainment of Plato's philosophy. His ethical system was in direct dependence upon his dialectics. He believed that the ideas of all existing things were originally contained

in God. These ideas were each the perfection of its kind, and as such were viewed by God with approval and love. God himself being infinitely good was the object of all imitation to intelligent beings; hence the ethics of Plato had a double foundation, the imitation of God and the realization of ideas, which were in each particular the models of perfection. To his cosmical theories he attributed only probability, holding that the dialectical method by which truth alone could be discovered was applicable only to ideas and the discovery of moral principles. The most valuable part of Plato's cosmogony is its first principle, that God, who is without envy, planned all things that they should be as nearly as possible like himself. Plato's political treatises are the application of his ethical principles to social organization. His genius was more adapted to build imaginary republics than to organize real ones; hence his judgment of statesmen is also faulty and often unjust, as, for instance, in the case of Pericles and Themistocles. He was guided by one grand principle, which is mentioned in several of his writings, that the object of the education and instruction of young people, as well as of the government of nations, is to make them better; and whoever loses sight of this object, whatever merit he may otherwise possess, is not really worthy of the esteem and approbation of the public.

The followers of Plato have been divided into the Old, Middle, and New Academies; or into five schools: the first representing the Old, the second and third the Middle, and the fourth and fifth the New Academy. In the first are Speusippus, Xenocrates, Heraclides, and others. Of these, the first reverted to pantheistic principles, the second to mysticism, and the last was chiefly distinguished as an astronomer. In the Middle Academy, of which were Arcesilas and Carneades, the founders of the second and third school, skeptical tendencies began to prevail. The New Academy began with Philo of Larissa, founder of the fourth school. Its teachings, however, deviated widely from his views.

Platoff (plä'tof), hetman of the Cossacks and a distinguished Russian cavalry officer, born about 1763–65; died 1818. He successfully fought the Turks in Moldavia, and largely contributed to the great disaster which befell the French army retreating from Moscow in 1812.

Platonic Love (pla-ton'ik), a term by which is generally understood a pure spiritual affection between the sexes unmixed with carnal desires, and regarding the mind only and its excellences.

Platoon (pla-tön'), in military language, meant formerly a small body of men in a battalion of foot, etc., that fired alternately. The term is now applied to two files forming a subdivision of a company; hence also *platoon-firing*, firing by subdivisions.

Platt, Thomas Collier, political leader, born at Oswego, New York, in 1833; died in 1910. He was elected to Congress in 1873 and to the Senate in 1881, but resigned the same year, with his colleague Conkling, from opposition to President Garfield's civil service policy. In 1880 he became president of the United States Express Company. His time was largely devoted to political management, and for years he was the autocrat of the Republican party in New York. He was re-elected to the Senate in 1896 and again in 1903.

Plattdeutsch (plät'doich), or Low German, is the language of the North German Lowlands, from the borders of Holland to those of Russian Poland. The Dutch and Flemish languages also belong to the Low German dialects, but being associated with an independent political system, and having a literature of their own, are reckoned as distinct languages. The Low German dialects agree in their consonantal system not only with Dutch and Flemish, but also with English and the Scandinavian tongues. (See *Philology.*) Until the Reformation Low German was the general written language of the part of the continent above mentioned; but from that time Low German works became gradually fewer, owing to the position now taken by the High (or modern classical) German. Even as a spoken language High German has ever since been slowly superseding the Low. In recent times, however, Low German literature has received a new impetus from Klaus Groth and Fritz Reuter. Linguistically the Low German dialects have received a good deal of attention, and many valuable lexicographical works have appeared.

Platte (plat), a river of the western United States, which rises in the Rocky Mountains by two branches, called respectively the North and South Forks of the Platte. The united stream falls into the Missouri after a course of about 1600 miles. It is from 1 mile to 3 miles broad, shallow, encumbered with islands, has a rapid current, and is therefore not navigable.

Plattensee (plat'ėn-zā). See *Balaton.*

Plattner (plat'nėr), CARL FRIEDRICH, a German metallurgist, born in 1800; died in 1858. From 1842–57 he held the professorship of metallurgy at Freiberg, and taught and experimented with great success. He is best known for his application of the blowpipe to the quantitative assay of metals.

Plattsburg (platz'burg), a town of New York, county seat of Clinton Co., on Cumberland Bay, Lake Champlain, at the mouth of Saranac River, 168 miles N. by E. of Albany. It is a lake port of entry, with a good harbor; lumber, iron, pulp, paper, automobile engines, and grain being the chief articles of export. The river supplies water power, and iron, flour, sewing machines, pulp, paper, etc., are manufactured. Plattsburg is a military post, with one of the largest barracks in the United States. Near here, on Sept. 11, 1814, Commodore McDonough gained a victory over the British lake fleet, and an army which had attacked the town was also repulsed. Pop. (1920) 10,909.

Plattsmouth, a city, capital of Cass Co., Nebraska, on the Missouri River, 22 miles S. of Omaha. A steel bridge 2900 feet long here crosses the river. There are railroad shops, flour mills, etc., and a trade in grain and cattle. Pop. 4287.

Platyelmia (pla-ti-el'mi-a; 'Flatworms'), a division of the class Scolecida. They are represented by the tapeworm, 'flukes,' etc.

Platypus (plat-i'pus). See *Ornithorhynchus.*

Platyrhina (plat-i-rī'na). See *Monkeys.*

Plauen (plou'en), a thriving manufacturing town in Saxony, circle of Zwickau, in a beautiful valley on the left bank of the Elster, 60 miles S. of Leipzig, 78 miles W. S. W. of Dresden. It is walled and has a castle. Manufactures machinery, paper, leather, calicoes, and extensively all kinds of embroidered goods. Pop. (1910) 121,272.

Plautus (plą'tus), TITUS MACCIUS, one of the oldest and best Roman comic writers, and one of the founders of Roman literature, born at Sarsina, in Umbria, about B.C. 254; died B.C. 184. We have few particulars of his life. He is said to have been first connected with a dramatic company at Rome; then to have engaged in business, but losing his means was at one time in a very destitute condition, and compelled to earn his livelihood by turning a baker's handmill. At this period he became a successful writer of comedies. The purity of his language, his genuine humor, and his faithful portrayal of middle and lower class Roman life made him a great favorite with the Roman public, and his plays successfully held the stage for some centuries. He was much admired by Cicero and Varro. For his characters, plots, scenes, etc., he was chiefly indebted to the poets of the new Attic comedy, but the language was his own. Some twenty of his plays have been preserved to us, a few of them more or less mutilated.

Playfair (plā'fār), JOHN, a Scottish natural philosopher and mathematician, born in Forfarshire in 1748; died at Edinburgh in 1819. He entered the University of St. Andrews at fourteen, where he soon displayed special talent for mathematics and natural philosophy. Having entered the church he held a living for some years. In 1785 he was chosen assistant professor of mathematics in the University of Edinburgh. In 1802 appeared his *Illustrations of the Huttonian Theory of the Earth*, and in the following year a *Biographical Account of Dr. James Hutton.* In 1805 he obtained the chair of natural philosophy in Edinburgh University. The Royal Society of London elected him a member in 1807. He paid a visit to the continent in 1815, and spent some seventeen months in France, Switzerland, and Italy. He published *Elements of Euclid* and *Outlines of Natural Philosophy*, and contributed many valuable papers to the *Transactions* of the Royal Society of Edinburgh, the Royal Society of London, and the *Edinburgh Review.* His writings are models of composition and argument.

Playfair, SIR LYON, a British scientist and politician, son of Dr. G. Playfair, inspector-general of hospitals in Bengal, was born at Meerut, Bengal, in 1819, and educated at St. Andrews and Edinburgh universities. He studied chemistry under Graham in Glasgow and London, and under Liebig at Giessen. His able reports on the sanitary condition of the large towns of Britain, and his valuable services as special commissioner at the London Exhibition of 1851 first brought him prominently before the public. He became connected with the science and art department at its establishment in 1853, inspector-general of government museums and schools of science in 1856, and was professor of chemistry at Edinburgh University, 1858-69. He wrote many social and political essays. Died in 1898.

Pleasantville, a residential city and summer resort of Atlantic Co., New Jersey, 5 miles N. W. of

Atlantic City. It has a few minor industries. Pop. (1920) 5887.

Playing Cards. See *Card.*

Plebeians (ple-bē'anz), or PLEBS, in ancient Rome, one of the great orders of the Roman people, at first excluded from nearly all the rights of citizenship. The whole government of the state, with the enjoyment of all its offices, belonged exclusively to the Patricians, with whom the Plebeians could not even intermarry. The civil history of Rome is to a great extent composed of the struggles of the Plebeians to assert their claim to the place in the commonwealth to which their numbers and social importance entitled them, and which were crowned with complete success when (B.C. 286) the Lex Hortensia gave the *plebiscita*, or enactments passed at the plebeian assemblies, the force of law. From this time the privileges of the two classes may be said to have been equal.

Plebiscite (pleb'i-sīt), a vote of a whole nation obtained by universal suffrage, a form of voting introduced into France under the Napoleonic régime, and named after the Roman *plebiscita.* (See above article.) The term is also used in a more general sense.

Plectognathi (plek-tog'na-thi), a suborder of Teleostean fishes, distinguished by the maxillary and intermaxillary bones on each side of the jaw being firmly united together by bony union. The head is large, and the union of its bones firmer than in any other Teleostean fishes; the body generally short, skin horny, fins small and soft. As examples of the chief fishes included in this group we may cite the trunk-fishes, the file-fishes, the globe-fishes, the sun-fishes, etc.

Pledge (pledj), or PAWN, in law, is a species of bailment, being the deposit or placing of goods and chattels, or any other valuable thing of a personal nature, as security for the payment of money borrowed, or the fulfillment of an obligation or promise. If the money is not paid at the time stipulated the pawn may be sold by the pawnee, who may retain enough of the proceeds to pay the debt intended to be secured. See *Pawnbroker.*

Pleiades (plī'a-dēz), the so-called 'seven stars' in the neck of the constellation Taurus, of which only six are visible to the naked eye of most persons. They are regarded by Mädler as the central group of the Milky Way. Ancient Greek legends derive their name from the seven daughters of Atlas and the nymph Pleione, fabled to have been placed as stars in the sky, and the loss of the seventh was variously accounted for. In reality the cluster consists of far more than seven stars.

Pleistocene (plīs'to-sēn; Gr. *pleistos*, most, and *kaimos*, recent), in geology, the lower division of the Post-tertiary formation. It is also known as the GLACIAL SYSTEM, and rests upon the Pliocene, being the latest of the fossil-bearing formations. The fossil remains belong almost wholly to existing species. The Pleistocene mollusca all belong to still living species, but its mammals include a few extinct forms. It is also known as the 'glacial' or 'drift' period, owing to the great prevalence of glaciers and icebergs at that period. See *Pliocene.*

Plenipotentiary (plen-i-pō-ten'shâ-ri), an ambassador appointed with full power to negotiate a treaty or transact other business. See *Ministers.*

Pleonasm (plē'u-nazm), in rhetoric, is a figure of speech by which we use more words than seem absolutely necessary to convey our meaning, in order to express a thought with more grace or greater energy; it is sometimes also applied to a needless superabundance of words.

Plesiosaurus (plē-si-o-sa'rus), a genus of extinct amphibious animals, nearly allied to the Ichthyosaurus. The remains of this curious genus were first brought to light in the Lias of Lyme Regis in 1822, but over twenty species are now known, and they have formed the subject of important memoirs by Owen and other palæontologists. Its neck was of enormous length,

Plesiosaurus, partially restored.

exceeding that of its body; it possessed a trunk and tail of the proportions of an ordinary quadruped: to these were added the paddles of a whale. The neck vertebræ numbered forty or fewer. From twenty to twenty-five dorsal segments existed; and two sacral vertebræ and from thirty to forty caudal segments completed

the spine. No distinct breastbone was developed. The head was not more than 1-12th or 1-13th of the length of the body; the snout of a tapering form; the orbits large and wide. The teeth were conical, slender, curved inwards, finely striated on the enameled surface, and hollow throughout the interior. These animals appear to have lived in shallow seas and estuaries, and, in the opinion of some, they swam upon or near the surface, having the neck arched like the swan, and darting it down at the fish within reach. Some of the Plesiosauri were upwards of 20 feet long. Their remains occur from the Lias to the Chalk rocks inclusive, these forms being thus exclusively of the Mesozoic age.

Plethora (pleth'u-ra), in medicine, an excess of blood in the human system. A florid face, rose-colored skin, swollen blood-vessels, frequent nose-bleeding, drowsiness and heavy feeling in the limbs, and a hard and full pulse are symptoms of this condition, habitual in many persons, and which, if not actually a disease, yet predisposes to inflammations, congestions, and hemorrhages. Plethora may, however, develop in persons of all conditions and ages as the result of too much stimulating food (as an excessive meat-diet), overeating, large consumption of malt and spirituous liquors, residence in northern and elevated regions with sharp, dry air, want of exercise, too much sleep, amputation of a limb — in short, of any action tending to unduly increase the volume of blood. Plethora of a mild form may be reduced by copious draughts of diluents, a vegetable diet, and plenty of exercise; but in cases requiring prompt relief leeches or bleeding must be resorted to.

Pleura (plö'ra), the serous membrane lining the cavity of the thorax or chest, and which also covers the lungs. Each lung is invested by a separate pleura or portion of this membrane. In the thorax each pleura is found to consist of a portion lining the walls of the chest, this fold being named the *parietal layer* of the pleura. The other fold, reflected upon the lung's surface, is named in contradistinction the *visceral layer.* These two folds inclose a space known as the *pleural cavity*, which in health contains serous fluid in just sufficient quantity to lubricate the surfaces of the pleuræ as they glide over one another in the movements of respiration. The disease to which the pleuræ are most subject is *pleurisy* (which see).

Pleurisy (plö'ri-si), the inflammation of the pleura. It may be acute or chronic, simple or complicated with catarrh and pneumonia. Generally part only of the pleura is affected, but sometimes the inflammation extends to the whole, and even to both pleuræ (double pleurisy). Acute, it is a very common complaint, due to a variety of causes, but most frequently to sudden chills. It invariably commences with shivering, its duration and intensity generally indicating the degree of severity of the attack; fever and its attendant symptoms succeed the shivering. A sharp, lancinating pain, commonly called stitch in the side, is felt in the region affected at each inspiration. A short, dry cough also often attends this disease. While the inflammation continues its progress a sero-albuminous effusion takes place, and when this develops the febrile symptoms subside, usually from the fifth to the ninth day. Acute pleurisy is seldom fatal unless complicated with other diseases of the lungs or surrounding parts, and many patients are restored simply by rest, moderate sweating in bed, spare and light diet, mild and warm drinks, and the application of hot mustard and linseed-meal poultices to the affected part. Opiates to relieve pain are often needful. When acute pleurisy is treated too late or insufficiently it may assume the chronic condition, which may last from six weeks to over a year, and result in death from gradual decay, as in the case of consumptives, or from asphyxia. Chronic pleurisy is characterized by effusion, which accumulates in the pleural cavity, and soon tends to produce lesions and complications in the surrounding organs. Besides local treatment purgatives and diuretics are used, but if the disease does not yield to these remedies, the liquid must be evacuated by operation. Pleurisy, acute and chronic, sometimes also appears without accompanying pain; it is then called *latent* pleurisy.

Pleurisy-root. See *Butterfly-weed.*

Pleuronectidæ (plö-rō-nek'ti-dē), the group or fishes included in the section Anacanthini of that order, and represented by the soles, flounders, brill, turbot, halibut, plaice, etc. The scientific name Pleuronectidæ therefore corresponds to the popular designation of 'Flat-fishes' applied to these forms.

Pleuro-pneumonia (plö'rō-nö-mō'ni-a), a form of pneumonia peculiar to the bovine race. It is highly contagious, and proves rapidly fatal. It first manifests itself in a morbid condition of the general system: but its seat is in the lungs and the pleura, where it causes an abundant inflamma-

tory exudation of thick plastic matter. The lungs become rapidly filled with this matter, and increase greatly in weight. Whether pleuro-pneumonia is specifically a local or general disease is disputed, as also the manner of treatment. On the one hand, bleeding and mercurial treatment, as in pleurisy and pneumonia, are recommended. On the other, evacuating remedies, maintaining the strength of the animal, and promoting the action of the skin, bowels, and kidneys, are employed.

Plevna (plev'na), the chief town of one of the new districts into which the principality of Bulgaria is divided. It lies a little over 3 miles east of the Vid, a tributary of the Danube, and commands a number of important roads, being hence of some strategetical importance. It is noted for the gallant resistance of its garrison under Osman Nubia Pasha during the last Russo-Turkish war. Pop. (1910) 23,049.

Pleyel (plā'el), IGNAZ, composer, was born in Austria in 1757; died at Paris in 1831. He studied under Haydn, and rapidly created a reputation in Italy, France, and England. He founded a musical establishment at Paris, which became one of the most important in Europe, and edited the *Bibliothèque Musicale*, in which he inserted the best works of the Italian, German, and French composers. His own works, chiefly instrumental pieces, are light, pleasing, and expressive.

Plica Polonica (plē'ka po-lon'i-ka), or TRICHOMA (trī-kō'ma), a disease peculiar to Poland and the immediately adjacent districts, but which at one time was also common in many parts of Germany. The roots of the hair swell, a nauseous, glutinous fluid is secreted, and the hair becomes completely matted. It is generally confined to the head, but other parts of the body covered with hair may also be affected; and sometimes the nails become spongy and blacken.

Plim'soll, SAMUEL, known as 'the sailor's friend,' a legislator, born at Bristol, England, in 1824. In 1854 he started business in the coal trade in London, and shortly afterward began to interest himself in the sailors of the mercantile marine, and the dangers to which they were exposed, especially through overloading, and the employment of unseaworthy ships. He entered Parliament in 1868, and succeeded in getting passed the Merchant Shipping Act in 1876. In 1890 the fixing of the load line was taken out of the owner's discretion and made a duty of the Board of Trade. He died in 1898.

Plinth, in architecture, the lower square member of the base of a column or pedestal. In a wall the term plinth is applied to the plain projecting band at its lowest part.

Pliny (plin'i), CAIUS PLINIUS SECUNDUS, a Roman writer, commonly called *Pliny the Elder*, was born A.D. 23, probably at Comum (Como). He came to Rome at an early age, and having means at his disposal availed himself of the best teachers. He served with distinction in the field, and after having been made one of the augurs of Rome, he was appointed governor of Spain. Every leisure moment that he could command was devoted to literature and science, and his industry was so great that he collected an enormous mass of notes, which he utilized in writing his works. He adopted his nephew, Pliny the Younger, A.D. 73, and perished in the eruption of Mount Vesuvius which overwhelmed Pompeii and Herculaneum in 79. The only work of Pliny which is now extant is his *Natural History*, a work containing a mass of information on physics, astronomy, etc., as well as natural history proper, fable and fact being intermingled.

Pliny, CAIUS PLINIUS CÆCILIUS SECUNDUS, *the Younger*, a nephew of the former, was born A.D. 61 at Comum (Como). Having lost his father at an early age, he was adopted by his uncle, and inherited the latter's estates and MSS., and also his industry and love of literature. He filled several public offices, and was consul in A.D. 100. In A.D. 103 he was appointed proprætor or governor of the province of Pontica, which office he administered for almost two years to the general satisfaction. He was one of the most distinguished and best men of his age. The time of his death is unknown, but it is supposed that he died about the year 115. As an author he labored with ardor, and attempted both prose and poetry. Of his writings only a collection of letters in ten books, and a panegyric on Trajan, remain.

Pliocene (plī'u-sēn; Gr. *pleion*, more; *kainos*, recent), a geological term applied to the most modern of the divisions of the Tertiary epoch. The Tertiary series Sir C. Lyell divided into four principal groups, namely, the *Eocene* and the *Miocene* (which see), the *Older Pliocene*, and the *Newer Pliocene* or *Pleistocene*, each characterized by containing a very different proportion of fossil *recent* (or existing) species. The Newer Pliocene, the latest of the four, contains from 90 to 95 per cent. of recent

fossils; the Older Pliocene contains from 35 to 50 per cent. of recent fossils. The Newer Pliocene period is that which immediately preceded the recent era; and by the latest system of classification it has been removed from the Tertiary and placed in the Post-tertiary or Quaternary epoch. The Pliocene period proper, or the Crag period, is that which intervened between the Miocene and the Newer Pliocene. Both the Newer and the Older Pliocene exhibit marine as well as fresh-water deposits.

Plock, PLOTZK (plotsk), capital of the government of the same name in Russian Poland, on the right bank of the Vistula, 78 miles N. W. of Warsaw. It has a handsome cathedral, dating from the tenth century, and a bishop's palace. Its manufactures are unimportant, but it has a large trade. Pop. 30,771.—The province has an area of 3674 square miles, mostly level, and marshes and lakes abound. Fully one-third of the area is forest. Corn and potatoes are the chief agricultural products, and sheep and cattle are extensively reared. Pop. (1906) 619,000.

Plotinus (plō-tī'nus), the systematic founder of Neo-Platonism, born in 205 A.D., at Lycopolis, in Egypt; died in the Campagna, Italy, 270. Little is known of his early life. In his twenty-eighth year the desire to study philosophy awoke in him, but he got no satisfaction from his teachers till a friend led him to Ammonius Saccas (which see). He spent eleven years near this excellent master, and the knowledge he had acquired created an ardent desire in him to know also the teachings of the Persian and Indian philosophers. For this purpose he joined the expedition of the Emperor Gordian to the East in 242, but after the latter's death he reached Antioch with difficulty and returned to Rome, where he subsequently lived and taught. At first he taught orally, but after ten years he was prevailed upon to commit his doctrines to writing, and he composed twenty-one books, which were only put into the hands of the initiated. About 262–264 Porphyry became his pupil, and during his six years' stay in Rome, twenty-four books were written by Plotinus, and nine more after Porphyry had left for Sicily. On account of the weakness of his sight Plotinus left the correction of his works to Porphyry, who also was his literary executor, and has arranged his works in six *Enneads*, which form the bible of the New Platonists. His teaching secured him great respect and popularity among the Romans. He was held to be so wise and virtuous that parents left their children to his care. He enjoyed the favor of the Emperor Gallienus, and he even succeeded in inspiring the fair sex with a desire to study philosophy. The writings of Plotinus are often obscure and even incomprehensible, but on the whole they exhibit a fertile and elevated mind and close reasoning. His system depends less upon the intrinsic truth it contains than upon its historical value, which is great both in its antecedents and consequents. Plotinus was well acquainted with the older Greek philosophy, with the Ionian and the Eleatic schools, with Plato and Aristotle and other founders of systems, and according to the eclectic tendencies of his day he believed there was a fundamental unity in these various systems. It was to Plato, however, that Plotinus looked as his great authority. He believed himself a strict follower of Plato, and his own system a legitimate development of the principles of that great philosopher.

Plover (pluv'er), the common name of several species of grallatorial birds belonging to the genus *Charadrius*. They inhabit all parts of the world. They are gregarious, and most of them are partial to the muddy borders of rivers and marshy situations, subsisting on worms and various aquatic insects; but some of them affect dry sandy shores. Their general features are: bill long, slender, straight, compressed; nostrils basal and longitudinal; legs long and slender,

Golden Plover (*Charadrius pluviālis*).

with three toes before, the outer connected to the middle one by a short web; wings middle-sized. Most of them molt twice a year, and the males and females are seldom very dissimilar in appearance. The various species pass so imperceptibly into one another that their classification is often attended with difficulty. All nestle on the ground. They run much on the soil, patting it with their feet to bring out the worms, etc. The golden plover (*Charadrius pluviālis*), also called yellow and whistling plover, is the best

known, and its flesh and its olive-green, dark-spotted eggs are considered a delicacy by epicures.

Plow (plou), an implement drawn by animal or steam power, by which the surface of the soil is cut into longitudinal slices, and these successively raised up and turned over. The object of the operation is to expose a new surface to the action of the air, and to render the soil fit for receiving the seed or for other operations of agriculture. Plows drawn by horses or oxen are of two chief kinds: those without wheels, commonly called *swing-plows*, and those with one or more wheels, called *wheel-plows*. The essential parts of both kinds of plows are, the beam, by which it is drawn; the stilts or handles, by which the plowman guides it; the coulter, fixed into the beam, by which a longitudinal cut is made into the ground to separate the slice or portion to be turned over; the share, by which the bottom of the furrow-slice is cut and raised up; and finally, the mold-board, by which the furrow-slice is turned over. The wheel-plow is merely the swing-plow with a wheel or pair of wheels attached to the beam for keeping the share at a uniform distance beneath the surface. Besides these two kinds there are *subsoil-plows*, *drill-plows*, *draining plows*, etc. Every part of a plow of the modern type is made of iron. *Double mold-board* plows are common plows with a mold-board on each side, employed for making a large furrow in loose soil, for earthing-up potatoes, etc. *Turn-wrest plows* are plows fitted either with two mold-boards, one on each side, which can be brought into operation alternately, or with a mold-board capable of being shifted from one side to the other, so that, beginning at one side of a field, the whole surface may be turned over from that side, the furrow being always laid in the same direction. One of these plows with two mold-boards is so constructed as to be dragged by either end alternately, the horses and plowmen changing their position at the end of every furrow. Such plows are useful in plowing hillsides, as the furrows can all be turned towards the hill, thus counteracting the tendency of the soil to work downwards. In the most improved style of wheel-plow there are a larger and a smaller wheel, the former to run in the furrow, the latter on the land. These have also a second or skim coulter, for use in lea plowing, to turn over more effectually the grassy surface. What is called a *gang-plow* is essentially a number of plows combined, four, six, or eight shares being fixed in one wheeled frame, and dragged by a sufficient number of horses, such plows being used on very large farms.—*Steam-plows* on various principles have also been adopted. Some are driven by one engine remaining stationary on the headland, which winds an endless rope (generally of wire) passing round pulleys attached to an apparatus called the 'anchor,' fixed at the opposite headland, and round a drum connected with the engine itself. Others are driven by two engines, one at either headland, thus superseding the 'anchor.' As steam-plowing apparatus are usually beyond both the means and requirements of single farmers, companies have been formed for hiring them out. In steam-plowing it is common to use plows in which two sets of plow bodies and coulters are attached to an iron frame moving on a fulcrum, one set at either extremity, and pointing different ways. By this arrangement the plow can be used without turning, the one part of the frame being raised out of the ground when moving in one direction, and the other when moving in the opposite. It is the front part of the frame, or that farthest from the driver, which is elevated, the plowing apparatus connected with the after part being inserted and doing the work. Generally two, three, or four sets of plow bodies and coulters are attached to either extremity, so that two, three, or four furrows are made at once. In addition to the stationary engine, gasoline motors have been introduced to draw plows, one of these taking the place of a considerable number of horses. The plow, as originally used, was a very rude and ineffective instrument. and plows of this imperfect character are still in use even in parts of Europe. Small plows are made for hand-plowing.

Plow-land, is an equivalent expression with a *hide* of land. It is defined as containing as much land as may be tilled in a year and a day by one plow. It was fixed by 7 and 8 William III cap. xxix, for the purpose of repairing highways, at an annual value of £50. The quantity contained in a plow-gate appears to differ in different charters.

Plow Monday, the next Monday after Twelfth Day. On Plow Monday the plowmen in the northern part of England used to draw a plow from door to door, and beg money for drink.

Plum (*Prunus*), a genus of plants belonging to the natural order Rosaceæ, suborder Amygdaleæ. About a dozen species are known, all inhabiting the north temperate regions of the globe. They are small trees or shrubs, with alternate leaves and white flowers, either soli-

Photo by Louis R. Bostwick

THE "PLOWMAN" OF TO-DAY

Modern agricultural methods have revolutionized the life of the farmer by making it possible to cultivate great tracts of land without heavy labor expense. The gang plows drawn by powerful caterpillar tractors shown in this picture can do the work of 120 horses and 60 men at a comparatively low cost for gasoline (or kerosene) and oil. It is a far cry from the "weary plowman" of Gray's "Elegy" to the alert farmer of to-day.

tary or disposed in fascicles in the axils of the leaves. The common garden plum (*P. domestica*), introduced from Asia Minor, is the most extensively cultivated, and its fruit is one of the most familiar of the stone-fruits. The varieties are very numerous, differing in size, form, color, and taste. Some are mostly eaten fresh, some are dried and sold as prunes, others again are preserved in sugar, alcohol, sirup, or vinegar. They make also excellent jams and jellies, and the sirup from stewed plums forms a refreshing drink for invalids, and a mild aperient for children. Perhaps the most esteemed of all varieties is the green gage. (See *Green Gage.*) A very popular and easily grown sort is the *P. damascēna* or damson. The wood of the plum-tree is hard, compact, traversed with reddish veins, susceptible of a fine polish, and is frequently employed by turners and cabinet-makers. The sloe or black-thorn (*P. spinōsa*) is a species of wild plum bearing a small, round, blue-black, and extremely sour fruit. Its juice is made into prune-wine, which is chiefly employed by distillers, wine and spirit merchants, etc., for fining, coloring, purifying, and mellowing spirits.

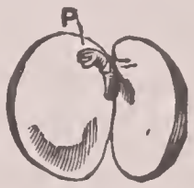
Plumbaginaceæ (plum-ba-jin-ā'-se-ē), PLUMBAGIN'EÆ, a nat. order of exogens, consisting of (chiefly maritime) herbs, somewhat shrubby below, with alternate leaves, and regular pentamerous, often blue or pink flowers. As garden plants nearly the whole of the order is much prized for beauty, particularly the Statices. The common thrift or sea-pink (*Armeria maritima*), with grass-like leaves and heads of bright pink flowers, is a familiar example. The type of this order is the genus *Plumbāgo*. It consists of perennial herbs or undershrubs, with pretty blue, white, or rose-colored flowers in spikes at the ends of the branches. *P. Europæa* is employed by beggars to raise ulcers upon their bodies to excite pity. Its root contains a peculiar crystallizable substance which gives to the skin a lead-gray color, whence the plant has been called *leadwort*.

Plumbago (plum-bā'go). See *Graphite.*

Plummet (plum'et), PLUMB-LINE, a leaden or other weight let down at the end of a cord to regulate any work in a line perpendicular to the horizon, or to sound the depth of anything. Masons, carpenters, etc., use a plumb-line fastened on a narrow board or plate of brass or iron to judge whether walls or other objects are perfectly perpendicular, or *plumb*, as the artificers call it. Near a range of high mountains the plumb-line, as can be shown by special arrangements, is not perfectly true, but inclines towards the mountains; and officers in charge of the United States Coast and Geodetic Survey among the Hawaiian Islands, have recently observed that the deviation of a plumb-line from the vertical is greater in the case of mountains in an island than in that of continental mountains, and greater in the neighborhood of extinct volcanoes than in that of active volcanoes. In given localities the plumb-line also varies according to the ebb and flow of the tide.

Plumptre (plump'tėr), EDWARD HAYES, Dean of Wells, born in 1821. He was graduated from Oxford, appointed chaplain at King's College, London, and was made professor of pastoral theology in 1853. He held various pastoral positions, and as an able theologian and preacher was chosen a member of the Old and New Testament Revision Companies in England, select preacher at Oxford (several times), Boyle lecturer, 1866-67, and Grinfield lecturer, 1872-74. He wrote a number of valuable works on theology, and we have from his pen several translations, including Sophocles (1866), Æschylus (1870), Dante (1887). He died in 1891.

Plumule (plö'mūl), in botany, that part of the seed which grows into the stem and axis of the future plant. In the seeds of the bean, horse-chestnut, etc., the plumule is distinctly visible, but in plants generally it is scarcely perceptible without the aid of a magnifying glass, and in many it does not appear until the seed begins to germinate. The first indication of development is the appearance of the plumule, which is a collection of feathery fibers bursting from the enveloping capsule of the germ, and which proceeds immediately to extend itself vertically upwards.



P, Plumule.

Plurality (plö-ral'i-ti), in ecclesiastical law, signifies the holding by the same person of two or more benefices. Pluralities were forbidden by the canon law, but the bishops and the pope assumed the right of granting dispensations to hold them. They were prohibited by the Councils of Chalcedon (451), Nicæa (787), and Lateran (1215). In England pluralities in the church are forbidden excepting in particular cases, as, for instance, where two livings are within three miles of each other, and the value and population of each being small.

Plus (L., more), in mathematics, signifies addition; the sign by which it is indicated is +; thus A + B, which is read A *plus* B, denotes that the quantity A is to be added to the quantity B. Plus, or its sign +, is also used to indicate a positive magnitude or relation, in opposition to *minus* —, which indicates a negative.

Plush, a fabric similar to velvet, from which it differs only in the length and density of the nap. The nap may be formed either in the warp or woof, the one in which it is being double, there being a warp and a woof for the body of the cloth, and a warp or a woof for the nap. Plushes are now made almost exclusively of silk. The cheaper qualities have a cotton backing. Some of the finest dress plushes are produced in London, plushes for gentlemen's hats come chiefly from Lyons, while common or imitation plushes are largely manufactured in Germany. Plush is now also extensively used in upholstery and decorative work.

Plutarch (plö'tårk; Greek, PLOUTARCHOS), a learned Greek writer, born at Cheronæa in Bœotia, where he also died. Neither the year of his birth nor that of his death is accurately known, but it is generally held that he lived from the reign of Nero to that of Adrian (54–117 A.D.). He appears from his writings to have visited Italy, lectured there on philosophy, and stayed some time at Rome, where he established a school during the reign of Domitian. His *Parallel Lives of Illustrious Greeks and Romans* is the work to which he owes his fame. The lives are nearly all written in pairs, one Greek and one Roman, followed by a comparison of the two, and are models of biographical portraiture. We have numerous editions and translations of them. Plutarch's other works, about sixty in number, are generally classed as *Moralia*, though some of them are narrative. His writings show that he was well acquainted with the literature of his time, and with history, and that he must have had access to many books.

Pluto (plö'tō), in classical mythology, the god of the infernal regions, the ruler of the dead. He was a son of Cronus and Rhea, a brother of Zeus (Jupiter) and Poseidon (Neptune), and to him, on the partition of the world, fell the kingdom of the shades. He married Persephonē (which see). By the Greeks he was generally called Hades and by the Romans Orcus, Tartarus, and Dis Pater. As is the case with all other pagan deities, the accounts of Pluto vary with different writers and periods, and in later ages he was confounded with Plutus. The worship of Pluto was extensively spread among the Greeks and Romans. The cypress, the box, the narcissus, and the plant adiantum (maiden-hair) were sacred to him; oxen and goats were sacrificed to him in the shades of night, and his priests were crowned with cypress. He is represented in gloomy majesty, his forehead shaded by his hair, and with a thick beard. In his hand he holds a two-forked scepter, a staff, or a key; by his side is Cerberus. He is often accompanied by his wife.

Plutonic Rocks (plö-ton'ik), unstratified crystalline rocks, such as granites, greenstones, and others, of igneous origin, formed at great depths from the surface of the earth. They are distinguished from those called volcanic rocks, although they are both igneous; plutonic rocks having been elaborated in the deep recesses of the earth, while the volcanic are solidified at or near the surface.

Plutus (plö'tus), in Greek mythology, the god of riches. Zeus struck him blind because he confined his gifts to the good; and he thenceforth conferred them equally on the good and the bad. His residence was under the earth. Plutus is the subject of Aristophanes's comedy of the same name.

Pluviose (plö'vi-ōs), the fifth month of the French Republican calendar, extending from January 20 to February 18 or 19. See *Calendar*.

Plymouth (plim'uth), a seaport of England, in Devonshire, at the head of Plymouth Sound, between the estuaries of the Plym and Tamar. Taken in its largest sense, it comprehends what are called the 'Three Towns,' or Devonport on the west, Stonehouse in the center, and Plymouth proper on the east. Plymouth proper covers an area of about 1 square mile, the site being uneven and somewhat rugged, consisting of a central hollow and two considerable eminences, one on the north, forming the suburbs, and the other, called the Hoe, on the south, laid out as a promenade and recreation ground. The old Eddystone Lighthouse has been re-erected in Hoe Park, which also contains a handsome statue of Sir Francis Drake by Boehm. The top of the Hoe offers magnificent land and sea views. The older parts of the town consist of narrow and irregular streets devoid of architectural beauty, but the newer parts and suburbs display an abundance of elegant buildings. The guild-hall, a Gothic building, is the finest modern edifice (1870–74), and has

a tower nearly 200 feet high; among other buildings are St. Andrew's Church, the postoffice, the Royal Hotel, theater, and the athenæum. The citadel, an obsolete fortification built by Charles II, is another object of interest. Plymouth is well defended both land- and sea-wards by a series of forts of exceptional strength provided with heavy ordnance. Charitable and educational institutions abound; the latter include a marine biological laboratory. The manufactures are not very extensive, and chiefly connected with ships' stores; but the fisheries are valuable, and Plymouth has a large export and coasting trade. Its chief importance lies in its position as a naval station. Thanks to extensive and sheltered harbors, Plymouth rose from a mere fishing village to the rank of foremost port of England under Elizabeth, and is now as a naval port second only to Portsmouth. To secure safe anchorage in the Sound a stupendous breakwater has been constructed at a cost of about £2,000,000. The Western Harbor, or the Hamoaze (mouth of the Tamar), is specially devoted to the royal navy, and here (in Devonport, which see) are the dockyard, and Keyham steam-yard; the victualing yard, marine barracks, and naval hospital being in Stonehouse. The mercantile marine is accommodated in the Eastern Harbor, the Catwater (200 acres), or estuary of the Plym, and in Sutton Pool, and the Great Western Docks in Mill Bay. Plymouth is supplied with water from Dartmoor by a *leat* or channel constructed by Sir Francis Drake. Pop. (1911) 112,042.

Plymouth, a seaport of Massachusetts, the seat of Plymouth county, 37 miles S. S. E. of Boston. It is situated in a capacious but shallow bay. and has extensive fisheries, rope and twine factories, woolen and worsted mills, foundry, wire factories, etc. Plymouth is the oldest town in New England, the place where the Pilgrims landed from the *Mayflower*, in 1620. The tercentenary of the landing of the Pilgrims was observed here and in Plymouth, England, in 1920. It has many objects of interest, notably Plymouth Rock, now restored to its original position; the National Monument and Pilgrim Hall. Pop. (1920) 13,045.

Plymouth, a borough of Luzerne Co., Pa., on the Susquehanna River, 4 miles below Wilkes-Barre. Coal-mining is extensively carried on, and there are hosiery and mining-drill factories. Pop. 16,500.

Plymouth a town (township) in Litchfield Co., Connecticut. It has various manufactures, including lumber, hardware, and other products. Pop. 5942.

Plymouth Brethren, PLYMOUTHITES, a sect of Christians who first appeared at Plymouth, England, in 1830, but have since considerably extended over Great Britain, the United States, and among the Protestants of France, Switzerland, Italy, etc. They object to national churches as being too lax, and to dissenting churches as too sectarian, recognizing all as brethren who believe in Christ and the Holy Spirit as his Vicar. They acknowledge no form of church government nor any office of the ministry, all males being regarded by them as equally entitled to 'prophesy' or preach. At first they were also called Darbyites, after Mr. Darby, originally a barrister, subsequently a clergyman of the Church of England, to whose efforts their origin and the diffusion of their principles are much to be ascribed. The Plymouth Brethren professedly model themselves upon the primitive church,

and at an early stage of the movement there was a tendency towards the adoption of the principle of community of goods. They also, in general, hold millennarian views, and Darby is exceedingly minute in carrying out the allegorical interpretation of the ceremonial and other figurative parts of the Old Testament. The interpretation of prophecy, as filling up in detail the entire rôle of history, is a feature of the views of Darby and the Plymouthists. They baptize adults and administer the sacrament, which each takes for himself, each Sunday. At their meetings a pause of unbroken silence ensues when no one is moved to speak. They hold both civil governments and ecclesiastical organizations to be under divine reprobation, the former as atheistic, the latter as in a state of apostasy. Theological differences early caused a split among the Plymouthists, and even during the lifetime of Darby there were three distinct divisions.

Plymouth Sound, an arm of the sea, on the south-west coast of England, between the counties of Devon and Cornwall. It is about 3 miles wide at its entrance, bounded by elevated land, which descends abruptly to the sea. It contains Drake Island, which is fortified, and the celebrated Plymouth Breakwater. See *Plymouth.*

Pneumatic Appliances (nū'mat-ik), are of wide variety, ranging from simple air-filled cushions to engines. Compressed air was first used as a motive power by Dennis Papin in England about 1700. It was first used successfully on a large scale in 1861 in connection with the construction of the Mont Cenis Tunnel. In 1867, A. E. Beach, an American, constructed a working model of an atmospheric railroad, but all attempts at pneumatic street traction in America failed. In 1886 J. G. Pohle, of Arizona, applied compressed air to the lifting of water, a method frequently used in connection with Artesian wells.

The foundation for docks and the piers for bridges are often sunk to the required depth by means of cylinders from which water is excluded by compressed air; and the same method is used in tunneling. Air is also used in pumping water for supply or drainage; in regulating temperature in steam-heated buildings, and in a wide variety of apparatus in which a simple mechanical push or pull is required. For use as a motive power in locomotives and automobiles air is stored at high pressure in a steel reservoir carried on the car, and is thence admitted into the driving cylinder. The force of suction obtained by exhausting the air in a confined space is used in grain elevators Suction pumps are also widely used in the common household vacuum cleaner (which see). See also *Air-brake, Air-gun,* etc.

Pneumatic Dispatch a method of sending parcels through a comparatively narrow tube by means of compressed air. In the United States, where the circuit system is employed, great progress has been made in the use of pneumatic power for post-office work. B. C. Batcheller invented an improved system which has found very extended use. It consists of double tubes (of cast iron made in 12-ft. lengths) running parallel to each other. At the central station a steam-engine compresses the air and forces it into one of the tubes, along which it rushes, returning by the other, a constant current being kept up. The tubes are worked at a pressure of six pounds per square inch, and for a distance of 4500 feet require about 30 horsepower, the transit speed being about 30 miles per hour. The system was first tried in Philadelphia in 1893, the tubes used being six inches in diameter. Eight-inch tubes are most common.

In the European system, as distinct from the American, the carriers being propelled from the central office by pressure and drawn in the opposite direction by a vacuum. In London, Paris, Berlin, and Vienna it is employed for the delivery of post-office telegrams. In London fifty of these main tubes, 2¼ in. in diameter, averaging nearly one mile in length, radiate from the central station. Different offices in the same building are also commonly connected by a number of short tubes, the whole system being supplied with power from one main station.

Pneumatic Gun, a gun which derives its power from compressed air. It is fired by pulling a lanyard, which releases the air.

Pneumatics, a former name for that branch of physics which treats of the properties of gases. See *Air, Air-pump, Atmosphere, Barometer, Gas, Pump,* etc.

Pneumatic Tools, a class of portable mechanical appliances operated by compressed air. The motor is self-contained, and they are generally worked by the hand. They are of two types—percussion and rotary. In the former the work is accomplished by rapidly repeated blows, and in the latter by a boring action. They are used for a great variety of mechanical operations permitting the actions of percussion and rotation, such as drilling, ramming, hammering, riveting, caulking, boring, screwing, expanding boiler tubes, and carving. A good representative of the percussion tools is the pneumatic hammer. It con-

sists of a cylinder in which a piston works with a reciprocating (back and forth) action, actuated by compressed air admitted to and exhausted from the cylinder by suitably arranged openings. A loose-fitting tool (such as a rivet-set, in case the appliance is employed as a riveter) is inserted in the front end of the cylinder to which the compressed air is conveyed by flexible hose connections, and through the handle at the rear. To operate the device is held by the handle and the tool is pressed firmly against the work. The operator then admits the air-pressure into the cylinder by pressing on the throttle lever, and starts the reciprocating hammer, which strikes the tool or rivet-set at each forward stroke. The action is similar to that of driving a chisel with a mallet or hammer, with the exception that the successive strokes are delivered with great rapidity, at a rate of speed as high as 20,000 blows per minute, the efficiency of the appliance being due to the frequency of the strokes rather than to the power of each individual stroke. Pneumatic percussion tools, in general, are made small enough to be operated by hand, and they are adapted for various uses by simply replacing the tool piece at the front end of the cylinder by tools specially shaped to fit the particular kind of work.

Pneumonia (nū-mō′ni-a), a name given to various diseases associated with consolidation of portions of the lung tissue. Formerly the disease was divided into three varieties: (1) Acute croupous or lobar pneumonia; (2) Catarrhal or broncho-pneumonia; (3) Interstitial or chronic pneumonia.

Acute croupous or lobar pneumonia (pneumonia fever) is now classed as an acute infective disease of the lung, characterized by fever and toxemia, running a definite course and being the direct result of a specific micro-organism, known as the *Pneumococcus*, or *Diplococcus pneumoniæ* (of which there are said to be three or four types). Other organisms are also present.

The symptoms are generally well marked from the beginning. The attack is usually ushered in by a rigor (or in children a convulsion), and the speedy development of the febrile condition, the temperature rising to a considerable degree—101 to 104 or more. The pulse is quickened, and there is a marked disturbance in the respiration, which is rapid, shallow and difficult, the rate being usually accelerated to some two or three times its normal amount. The lips are livid, and the face has a dusky flush. Pain in the side is felt, especially should any amount of pleurisy be present, as is often the case. The disease has a high mortality. The treatment consists of proper rest in bed in a well-ventilated room, with tonics, and attention to diet, bowels, and symptoms; hydrotherapy is of value, and 'bleeding' often aids. Serum and vaccine therapy are on trial, and may be worth considering when proper laboratory facilities are available.

The term 'broncho-pneumonia' is used to denote a widespread catarrhal inflammation of the smaller bronchi, which spreads in places to the alveoli and produces consolidation. All forms of broncho-pneumonia depend on the invasion of the lung by micro-organisms. No one organism has, however, been constantly found which can be said to be specific, as in lobar pneumonia; the influenza bacillus, micrococcus catarrhalis, pneumoccoccus, Friedlander's bacillus and various staphylococci having been found.

The symptoms characterizing the onset of catarrhal pneumonia in its more acute form are the occurrence during an attack of bronchitis or the convalescence from measles or whooping cough, of a sudden and marked elevation of temperature, together with a quickened pulse and increased difficulty in breathing. The cough becomes short and painful, and there is little or no expectoration. The physical signs are not distinct, being mixed up with those of the antecedent bronchitis; but, should the pneumonia be extensive there may be an impaired percussion note with tubular breathing and some bronchophony. Dyspnoea may be present in a marked degree; and death frequently occurs from involvement of the heart.

Chronic interstitial pneumonia (cirrhosis of the lung) is a fibroid change in the lung, chiefly affecting the fibrous stroma and may be either local or diffuse. The changes produced in the lung by this disease are marked chiefly by the growth of nucleated fibroid tissue around the walls of the bronchi and vessels, and in the intervesicular septa, which proceeds to such an extent as to invade and obliterate the air cells. The symptoms are very similar to those of chronic phthisis (see *Tuberculosis*). The malady is usually of long duration, many cases remaining for years in a stationary condition and even undergoing temporary improvement in mild weather, but the tendency is on the whole downward.

Pnom-penh (p'num pen'), the chief town of Cambodia, at the apex of the delta of the Mekong. Pop. about 60,000.

Po (pō; anciently *Padus* or *Eridănus*), the largest river of Italy. It rises

on the confines of France and Piedmont in Mount Viso, one of the Cottian Alps, and receives during its long course to the Adriatic (about 420 miles) a large number of tributary streams. It divides the great plain of Lombardy into two nearly equal parts, and is the grand receptacle for the streams flowing south from the Alps, and for the lesser waters that flow north from a part of the Apennine range.

Poa. See *Meadow-grass.*

Poaching (pōch'ing), the trespassing on another's property for the purpose of killing or stealing game or fish. For the law relating to the poaching of game see *Game Laws.* According to the law of England, when a person's land adjoins a stream where there is no ebb and flow that person is assumed to have an exclusive right to fish in the stream as far as his land extends, and up to the middle of the stream; and so also when a person's land incloses a pond, the fish in that pond belong to him. Where several properties are contiguous to the same lake the right of fishing in that lake belongs to the proprietors, in proportion to the value of their respective titles. Exclusive right of fishing in a public river, that is, one in which there is ebb and flow up to the tidal limit, or a portion of the sea, is held by some proprietors by virtue of royal franchises granted prior to the Magna Charta. Any person, not an angler, found fish-poaching on private property is liable to a maximum fine of £5, in addition to the value of the fish; an angler's fine does not exceed £2. If the act is committed on land belonging to the dwelling-house of the owner it becomes a misdemeanor, and such a fish-poacher, when caught in the act, may be arrested by anybody. Anglers cannot be arrested, even in the latter case, but the penalty extends to £5. The owner or his servant may deprive the angler of his fishing gear in lieu of a fine. The same law applies also to Ireland. In Scotland, as a general rule, the right of catching fish other than salmon belongs to the owner of the land on the banks of the waters. As to property in salmon fishings, that is held to be originally vested in the crown, not only for the rivers of Scotland but also for the coasts, and no person, accordingly, is allowed to fish for salmon unless he possesses a grant or charter from the crown enabling him to do so. The fact is, however, that nearly all the chief landed proprietors do possess such rights. The punishment for poaching salmon in Scotland is a fine not less than 10*s.* nor more than £5, together with the forefeiture of the fish taken, and the boat, tackle, etc., employed by the poacher, if the sheriff or justice think fit. Anyone not an angler poaching trout or any other fresh-water fish renders himself liable to a penalty of £5, besides forfeiting the fish caught. If he be caught in the act of using a net for poaching such fish he may be arrested, but not unless; but even when he may not be arrested his boat and fishing implements may be seized. A person who merely angles for trout in places where he has not got leave to fish is only liable to an action at law. Poaching in the British islands was formerly much more severely punished than at the present day. In the United States game laws are of comparatively recent adoption and fishing and hunting are largely free.

Pocahontas (pō-ka-hon'tas), daughter of Powhatan, a celebrated American-Indian warrior of Virginia, born about the year 1595. Some romantic incidents are told of her life, but there seem to be considerable doubts as to their truth. She is said to have shown a great friendship for the English who colonized Virginia, and to have rendered them substantial services. In 1607 she prevailed on her father to spare the life of Captain John Smith, his prisoner, and two years later frustrated a plot to destroy him and his party. After Captain Smith had left the colony she was kept as a hostage by an English expeditionary force (1612). During this detention she married Mr. Rolfe, an Englishman, who in 1616 took her on a visit to England, where she was baptized and assumed the name of Rebecca. She died the following year, and left one son, who was educated in London, and whose descendants are said to exist still in the State of Virginia.

Pocatello (pō-ka-tel'o), a city, county seat of Bannock Co., in the corner of S. E. Idaho. It is the livestock center of the intermountain states; has car shops and other industries. The State Academy is here. Pop. (1920) 15,001.

Pochard (pō'chard; *Fuligūla*), a subfamily of Anatidæ or ducks, inhabiting the Arctic regions. They migrate southwards in winter to the coasts of Europe and North America; and they even occur in Asia and in the southern hemisphere. They are marine in habits, and feed upon crustaceans, worms, molluscs, and aquatic plants. There are numerous species, and the flesh of several is much prized as food. A typical form and one of the best known is the *F. ferīna*, the common pochard, variously called dunbird, red-headed

poker, red-headed widgeon or duck. The head and neck are bright chestnut; eyes red; bill long; a broad, transverse, and dark-blue band on the upper mandible; length 16 to 17 inches; weight 1 to 2 lbs. Other familiar varieties are the *F. glaciālis*, or long-tailed duck; the scaup pochard (*F. marīla*); the tufted pochard (*F. cristāta*); and the canvas-backed duck of North America (*F. Valisneria*), so highly esteemed by epicures.

Poco (pō'kō; Italian for 'a little'), a term used in music in such phrases as *poco forte* (*p. f.*), rather loud; *poco animato*, with some animation; and so forth.

Pocock (pō'kok), EDWARD, an English oriental scholar, born at Oxford in 1604; died in 1691. He was graduated from Oxford, and was ordained priest in 1628. While at the university he acquired a taste for oriental literature, which he was able to gratify as chaplain to the English factory at Aleppo, 1629-36. Laud engaged him to collect manuscripts and coins for the University of Oxford, and in 1636 chose him to fill the newly-founded Arabic professorship at that university. The years between 1637 and 40 he spent at Constantinople studying and collecting Arabic manuscripts. Although a man of moderate views in church and state matters, he suffered from the troubles of his times. He was appointed to the Hebrew chair at Oxford in 1648, together with the rich canonry of Christ Church; but from 1650-60 he was deprived of his church preferment. His works are of great value to oriental and biblical students.

Pod, in botany, a general term applied to various forms of seed-vessels of plants, such as the legume, the loment, the siliqua, the silicle, the follicle, the capsule, etc.

Podagra (po-dag'ra), that species of gout which recurs at regular intervals, generally in spring or autumn, attacking the joints of the foot, particularly of the great toe, attended with a sharp, burning pain, and rendering the whole foot so sensitive that the slightest pressure, or even the agitation occasioned by a strong draught of air, causes torture. The pain can be assuaged by reducing the inflammation, promoting the secretion of the gouty matter, and by suitable diet and mode of living. See *Gout*.

Podargus (po-dar'gus), a genus of Australasian nocturnal birds of the goatsucker family. Like the goatsuckers, their mouths have a very wide gape. By day they are excessively drowsy. There are several species, one of which, Cuvier's podargus (*P. Cuvieri*), is known among the Australian settlers by the name of 'more pork' from its strange cry.

Podestà (pō-des'ta), an Italian word derived from the Latin *potestas*, power, equivalent in its original meaning to a holder of power or authority. In the middle ages the podestà wielded almost dictatorial power in many of the Italian cities. In the modern kingdom of Italy he is the chief official of a commune, corresponding to the French *maire*.

Podgoritza (pod'gō-rē-tza), formerly a Turkish stronghold against Montenegro, but incorporated with that principality since 1880. It lies about 35 miles north of Scutari, at the foot of a range of mountains. Pop. 7000.

Podiceps. See *Grebe*.

Podiebrad (pod'ye-brâd), GEORGE, King of Bohemia, born in 1420 of a noble family; died in 1471. When a mere youth he entered into the Hussite movement. In the war against Albert V of Austria he rendered eminent services, and secured the highest esteem of the Calixtines or Utraquists. In 1444 he was chosen head of the party, became one of the two governors of Bohemia during the minority of Ladislas, Albert's posthumous son, then king of the country, and, after overcoming the Catholic opposition, sole regent in 1451. Ladislas died in 1457, and Podiebrad was elected to the throne in the following year, and crowned by the Catholic bishops in 1459. He inaugurated his reign by the introduction of various beneficent laws, wise administration, and a policy of conciliation towards the Catholics; but he was not allowed to carry out his reforms in peace. The pope, Paul II, publicly denounced him as a heretic in 1463, excommunicated him, and his legate soon produced a rising among the Catholics. A German crusade was formed against Bohemia in 1466, but the invaders were defeated in several places. Matthias Corvinus, king of Hungary and son-in-law of Podiebrad, at the instigation of the pope and the Emperor Frederick invaded Moravia; but Podiebrad's generalship was again successful, and in 1469 he hemmed in the Hungarian army at Willemow. In order to secure the aid of the Poles he assembled a diet at Prague, and declared the successor to the throne of Poland to be his own successor, while his sons should only inherit the family estates (1469). The Poles were thus immediately drawn to his side; the

Emperor Frederick also declared in his favor; and his Catholic subjects became reconciled to him. Shortly after he destroyed the infantry of the Hungarians, which had again taken the field, and Matthias Corvinus hastily fled with his cavalry. He thus saw himself at last completely secured in his kingdom; but no sooner was this accomplished than he died; being succeeded by Ladislas, eldest son of Casimir IV, king of Poland, who thus united the two crowns.

Podium (pō'di-um), in architecture, a long pedestal supporting a series of columns. It is called a *stylobate* when the columns stand on projecting parts of it.

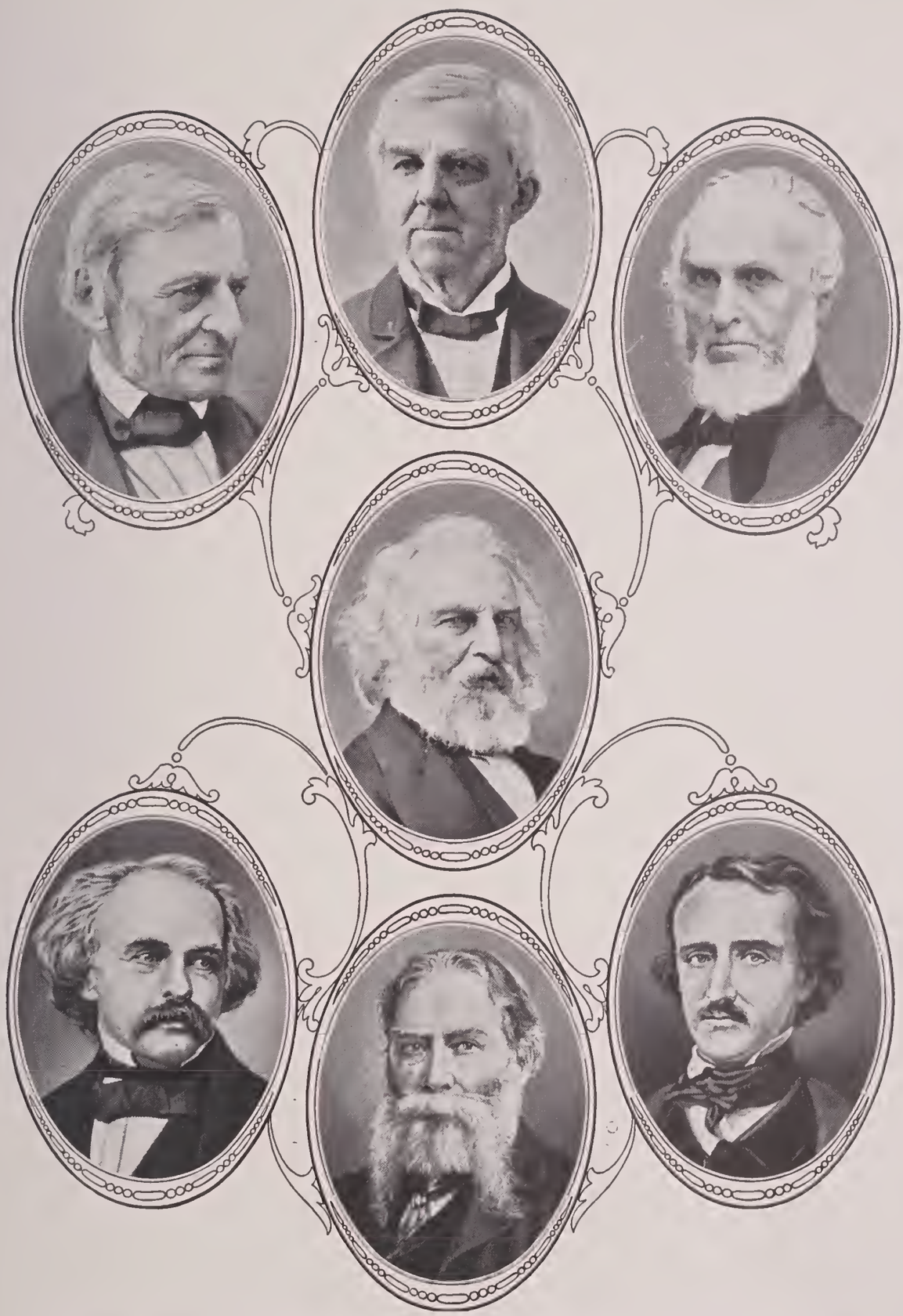
Podolia (po-dō'li-a), a government of Southwestern Russia; area, 16,224 sq. miles. The country is mostly flat, but a low branch of the Carpathians extends through it in an easterly direction. The principal rivers are the Dniester and the Bug. The climate is temperate and salubrious, the soil generally very fertile; in fact, Podolia forms one of the most valuable agricultural possessions of the Russian Empire. Manufactures are spreading rapidly, and beet-sugar, spirits, flour and tobacco are produced in great quantities. The trade with Germany, Austria and Odessa is extensive. Capital, Kamenetz. Pop. 3,543,700.

Podophthalmata (po-dof-thal'mata; 'stalk-eyed'), a division of the Crustacean class, primarily distinguished by compound eyes supported upon movable stalks termed *peduncles*. This division includes the orders Stomapoda and Decapoda, the former of which is represented by the 'locust,' 'glass' and 'opossum' shrimps, while the latter includes the familiar crabs, lobsters, common shrimps, hermit crabs, and their allies. See also *Crustacea*, *Crab*, *Lobster*, *Shrimp*, etc.

Podophyllin (pod-ō-fil'in), a resin obtained from the root-stock of the May apple (*Podophyllum peltatum*. See *May apple*). It is of a brownish-yellow color, dissolves readily in alcohol, and has been admitted to the pharmacopœias of many countries as a purgative; it is particularly beneficial in cases of sluggish liver, having much the same effect as mercury, but in some constitutions produces severe griping.

Poduridæ (po-dū'ri-dē), a family of apterous (wingless) insects belonging to the order Thysanura, distinguished by the possession of an elastic forked caudal appendage, which is folded under the body when at rest, and by the sudden extension of which they are enabled to effect considerable leaps; hence their popular name of springtails. Their scales are favorite test objects for microscopes.

Poe (pō), Edgar Allan, poet and romantic writer, born at Boston, Massachusetts, in 1809; died at Baltimore in 1849. His father and mother were actors, and being left an orphan when a mere child he was adopted by Mr. Allan, a wealthy Richmond merchant. His early education he received at Stoke-Newington, London, 1816-21, and on his return to America attended a school at Richmond, Virginia, and finally entered the University of Charlottesville. Here he displayed extraordinary talents, but also contracted a taste for fast living which occasioned quarrels with his benefactor, and caused him to quit America for Europe. He took part in the struggles of the Greeks for independence, and for a few years led an erratic life on the continent. In 1829 he returned to America, a reconciliation with Mr. Allan took place, and he was sent as cadet to the military academy at West Point. Further irregularities brought about a complete rupture with Mr. Allan, and Poe enlisted as a private soldier, however only to desert later on. His literary career may be said to have begun in 1835, when he gained the prize offered by the Baltimore *Saturday Visitor* for a tale and a poem. He then became successively editor of the newly-founded *Southern Literary Messenger* at Richmond, contributor to the *New York Review* at New York, and editor of *Burton's Gentleman's Magazine* and *Graham's Magazine* at Philadelphia. For these periodicals he wrote a number of tales, exhibiting a weird yet fascinating imagination. He also added to his reputation by poems of striking originality and rhythmic power. While at Richmond, in 1836, he married his cousin, Virginia Clemm, a beautiful and amiable girl. The great event in Poe's life was the publication at New York in 1845 of his poem, *The Raven*, which spread his fame to the whole English-speaking world. For this remarkable production Poe is said to have received $10. He was subsequently connected with *The Home Journal* and *The Broadway Journal*. In 1848 his wife died. Passing through Baltimore in 1849, on his way to New York to make preparation for a second marriage, he was led to excessive drinking, and died from its effects at the hospital. Poe's career is sad enough, and his faults were sufficiently numerous, but until John H. Ingram in 1874 published a biography of him, based on documents and ascer-



FAMOUS PROSE WRITERS AND POETS OF THE NINETEENTH CENTURY

Top row, left to right, Emerson, Holmes and Whittier; center, Longfellow; bottom row, Hawthorne, Lowell and Poe.

tained facts, the public were generally led to believe by Rufus Griswold, his first biographer, that his character was very much blacker than it really seems to have been. He has won an enduring reputation alike for his weird and striking tales and his rare and musical poems, while as a critic he also showed fine taste and judgment. Many regard him as the most original genius America has produced.

Poe-bird. See *Honey-eater.*

Poerio (po-ā′re-ō), Carlo, an Italian statesman, born at Naples in 1803; died at Florence in 1867. He opposed the actions of the Bourbon kings of Naples, and frequently devoted his talents as an advocate to the cause of political offenders. He thus became a suspect, and from 1837-48 suffered various terms of imprisonment. The revolution of the latter year released him from prison and placed him at the head of the Neapolitan police, and of the ministry of public instruction, but, finding it impossible to get the Bourbons to fulfill their promises, he resigned. He sat in the new parliament and acted with the opposition. In July, 1849, he was arrested and condemned without defense to twenty-four years' imprisonment. The barbarous treatment he received in prison gave occasion to Gladstone's famous *Two Letters* to Lord Aberdeen, written in 1851 from Naples. In 1859 his sentence was commuted to transportation to South America; but he and his companions in misfortune effected a landing at Cork in Ireland, and thence proceeded to London. In 1861 he was elected vice-president of the Italian chamber of deputies, and remained till his death one of the chiefs of the constitutional liberal party.

Poetry (pō′et-ri; from *poet*, the Greek *poiētēs*, a maker or creator), that one of the fine arts which exhibits its special character and powers by means of language; or, according to Aytoun, the art which has for its object the creation of intellectual pleasures by means of imaginative and passionate language, and of language generally, though not necessarily, formed into regular numbers. It has also been defined as the concrete and artistic expression of the human mind in emotional and rhythmical language. It is the earliest form of literature, and also the final and ideal form of all pure literature; its true place lying between music, on the one hand, and prose or loosened speech on the other. The two great classes of poetry are dramatic and lyric. Partaking of the character of both is epic or narrative poetry. (See *Epic.*) To the dramatic class belong tragedy and comedy; to the lyric belong the song, hymn, ode, anthem, elegy, sonnet and ballad, though the last-named frequently has a kind of epic character. *Poetics* is the theory of poetry—that branch of criticism which treats of the nature and laws of poetry.

Poggio Bracciolini (pod′jō brät-chō-lē′ni), an Italian scholar and prolific writer, born in 1380; died in 1459. He came early under the influence of the revival of literature in Italy. About 1402 he became writer of the apostolic letters under Boniface IX, and for fifty years remained connected with the papal curia.

Poincaré (pwan-kä-rā′), Henri, French mathematician and physicist, born at Nancy in 1854; died in 1912. He was professor at the University of Paris and made original contributions in pure mathematics, in celestial mechanics, and in the mathematics of physics. He has been called the greatest mathematician since Archimedes. His works include *Cours de physique mathématique* (1890), *Electricité et optique* (1890-91), *Thermodynamique* (1892), *Les methodes nouvelles de la mécanique célèste* (1892-99), *Théorie des turbillons* (1893), *Les oscillations électriques* (1894), *Capillarité* (1895), *Calcul des probabilités* (1896), *La science et hypothèse* (1902), etc.

Poincaré Raymond, a celebrated French author and statesman, a member of the French Academy, born August 20, 1860, at Bar-le-Duc. He practiced as a lawyer in Paris and began his public career by entering the Chamber of Deputies in 1887. After that time he filled various offices, as minister of finance, minister of public instruction, etc. In 1912 he assumed the post of premier, and on January 17, 1913, was elected to the presidency. His publications include *Idées contemporaines*, *Etudes et figures politiques*, *Causes littéraires et artisques.*

Poinsettia (poin-set′i-ä), a former genus of American apetalous plants of the order Euphorbiaceæ. The *Euphorbia pulcherrima*, a plant native to South America and Mexico and much cultivated in conservatories, is conspicuous for the large scarlet floral leaves surrounding its small green flower-heads.

Point, in geometry, is a quantity which has no parts, or which is indivisible, or which has position without magnitude. Points may be regarded as the ends or extremities of lines. If a point is supposed to be moved in any way, it will by its motion describe a line.

Pointe-à-pitre (pwânt-à-pē-tr), the principal port of the French W. Indian island Guadeloupe, on the southwest coast of Grande Terre, and one of the most important commercial towns of the Antilles. The town, mostly built of wood, was destroyed by fire in 1780, by an earthquake in 1843, and again by fire in 1871. Pop. 16,506.

Pointed Architecture, a name for Gothic (which see).

Pointer Dog (poin'tėr), a breed of sporting dogs, nearly allied to the true hounds. The original breed is Spanish, but a cross with the foxhound is now generally used. It is smooth, short-haired, generally marked black and white like the foxhound, but occasionally a uniform black. It derives its name from its habit of stopping and pointing with the head in the direction of game, discovered by a very acute sense of smell. The dog once having pointed remains perfectly quiet. This faculty in the pointer is hereditary, but is better developed by training.

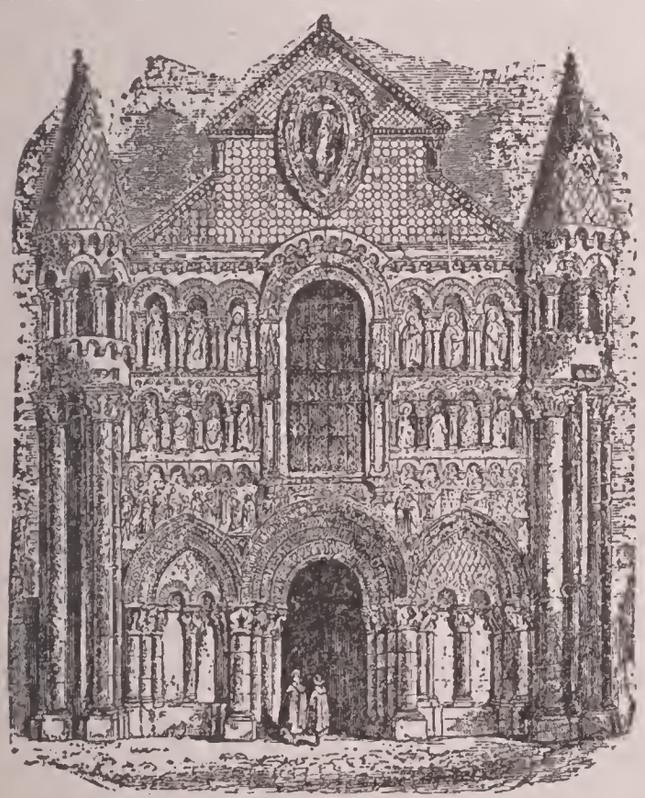
Poison (poi'zn), any agent capable of producing a morbid, noxious, dangerous, or deadly effect upon the animal economy, when introduced either by cutaneous absorption, respiration, or the digestive canal. Poisons are divided, with respect to the kingdom to which they belong, into animal, vegetable, and mineral; but those which proceed from animals are often called *venoms*, while those that are produced by disease have the name *virus*. With respect to their effects they have been divided into four classes, namely, irritant, narcotic, narcotico-acrid, and septic or putrescent. Many poisons operate chemically, corroding the organized fiber, and causing inflammation and mortification. To this class belong many metallic oxides and salts, as arsenic, one of the most deadly poisons; many preparations of copper, mercury; antimony, and other metals; the mineral and vegetable acids; the substance derived from some plants, as the spurges and mezereon; and cantharides, from the animal kingdom. Other poisons exercise a powerful action upon the nerves and a rapid destruction of their energy. These are the sedative or stupefying poisons, and belong for the most part to the vegetable kingdom. Opium, hemlock, henbane, belladonna, are the best-known forms of this poison. Prussic acid, a poison obtained from the kernels of several fruits, the cherry-laurel, etc., is one of the most rapid destroyers of life. Among plants there are many which unite the properties of both kinds, as the common foxglove, and the monkshood or aconite. An alkaloid is extracted from the latter, $\frac{1}{15}$th of a grain of which has proved fatal. Another class of poisons suddenly and entirely cause a cessation of some function necessary to life. To this class belong all the kinds of gas and air which are irrespirable, suffocating vapors, as carbonic acid gas, fumes of sulphur and charcoal, etc. Many preparations of lead, as acetate or sugar of lead, carbonate or white lead, etc., are to be counted in this class. The effects of poisons materially depend on the extent of the dose, some of the most deadly poisons being useful remedies in certain quantities and circumstances. Antidotes naturally vary with the different kinds of poisons. They sometimes protect the body against the operation of the poison, sometimes change this last in such a manner that it loses its injurious properties, and sometimes remove or remedy its violent results. Thus in cases of poisoning by acrid and corrosive substances we use the fatty, mucilaginous substances, as oil, milk, etc., which sheathe and protect the coats of the stomach and bowels against the operation of the poison. Against the metallic poisons substances are employed which form with the poison insoluble compounds, such as freshly prepared hydrated oxide of iron, or dialyzed iron for arsenic, albumin (white of egg) for mercury; Epsom or Glauber's salts for lead. Lime, chalk, baking soda, and magnesia are the best remedies for the powerful acids. For cantharides, mucilage, gruel, and barley-water are employed. We oppose to the alkaline poisons the weaker vegetable acids, as vinegar. Prussic acid is neutralized by alkalies and freshly precipitated oxide of iron. To arouse those poisoned by opium, we use coffee and ammonia, and belladonna as an antagonistic drug, the person being kept walking. Chloral-hydrate poisoning is similarly treated by the drug mentioned; and for strychnia or nux vomica, animal charcoal in water and chloral-hydrate are used. Poisoning was a common crime in ancient Rome, and in France and Italy during the seventeenth century. See *Aqua Tofana*, *Brinvilliers*.

Poison Ivy, or Poison Oak (*Rhus toxicodendron*), a species of sumach which bears three leaflets and usually has the climbing habit. It is very irritating to sensitive skins, producing an itching eruption which is highly annoying. Another species, *Rhus venenata*, the Poison-ash, Poison-elder, or Poison-sumach, is still more poisonous.

It is a handsome tree, but fortunately is largely confined to marshes.

Poison-nut, a name for *Strychnos nux-vomica,* an evergreen tree of the nat. order Loganiaceæ, the seeds of which yield strychnine. (See *Nux vomica.*) Also a name for the *Tanghinia venenifera,* of the nat. order Apocynaceæ, the fruit of which is a drupe enclosing a kernel extremely poisonous. It used to be employed in Madagascar as an ordeal-test of guilt or innocence, the result generally being the death of the suspected person.

Poitiers (pwâ-tyā), or POICTIERS, a town of France, on the Clain, formerly capital of the province of Poitou, at present of the department of the Vienne. The town occupies a large space, the houses being often surrounded by gardens and orchards; the streets are narrow and ill paved. The principal edifice is the cathedral, founded by Henry II of England about 1162. Poitiers is one of the most ancient towns



Façade, Church of Nôtre Dame, Poitiers.

of France, and the vestiges of a Roman palace, of Roman baths, of an aqueduct, and an amphitheater still remain. Two famous battles were fought in its vicinity, that in which Charles Martel defeated the Saracen army in 732, and that between the French under their king John II and the English under Edward the Black Prince in 1356. The manufactures are unimportant, but there is a large trade. Pop. 41,242.

Poitiers, DIANA OF. See *Diana of Poitiers.*

Poitou (pwâ-tö), one of the old provinces of France, between Brittany and Anjou on the north, Berry on the east, the Atlantic on the west, and Angoumois and Saintonge on the south. The departments of Vienne, Deux-Sèvres and Vendée have been formed out of this province. Henry II of England acquired possession of Poitou by his marriage with Eleanor, heiress of the last Duke of Aquitaine. Philip Augustus conquered it.

Poker (pō'kėr), an American game of cards for two or more persons, originally played with only twenty cards, all below the tens being excluded, but now played with the full pack. It is a popular gambling game, the mode of playing being to bet on the comparative strength of the cards held by the players.

Pokeweed (pōk'wēd), the *Phytolacca decandra,* a North American branching herbaceous plant, nat. order Phytolaccaceæ, which is naturalized in some parts of Europe and Asia. Its root acts as a powerful emetic and cathartic, but its use is attended with narcotic effects. Its berries are said to possess the same quality; they are employed as a remedy for chronic and syphilitic rheumatism, and for allaying syphiloid pains. The leaves are extremely acrid, but the young shoots, which lose this quality by boiling in water, are eaten in the United States as a substitute for asparagus.

Pola (pō'la), a town on the Adriatic, formerly the naval port of Austria-Hungary, 55 miles south of Trieste. It is an ancient place, and was for a lengthened period the principal town of Istria. Its former importance is well attested by architectural remains, chief among which are a colossal and well-preserved amphitheater and two temples. Pola had sunk to the level of a mere fishing-place with some 800 or 900 inhabitants, when the Austrian government, tempted by excellent harbor accommodation, selected it as its chief naval station; and by the erection of dockyards, of an arsenal, barracks, and other government establishments, infused new life into it. The entrance to the harbor is narrow, but the water is deep, and within it expands into a large basin, landlocked and safe. On the defeat of Austria in the European war, Pola was ceded to Italy by the Treaty of St. Germain, in 1919. Pop. 70,145.

Polacca (pō-lak'a), or POLACRE, a three-masted vessel used in the Mediterranean. The masts are usually of one piece, so that they have

neither tops, caps, nor crosstrees. It carries a fore-and-aft sail on the mizzenmast, and square sails on the mainmast and foremast.

Poland (pō'land; *Rzeczpospolita Polska*), a republic of Europe, bounded by Germany on the north and west; Lithuania and Latvia on the north; Czechoslovakia and Roumania on the south; Ukraine and Russia on the east. Area, about 149,000 sq. miles, including former Russian Poland, Galicia, former Prussian Poland, and Silesia. The population is about 26,880,000. It is divided into counties and districts, the counties being Warsaw, Lodz, Kielce, Lublin, Bialystok, Nowogrodek, Wolyn, Polesia, Poznan, Pomorze, Krakow, Lwow, Stanislawow, Tarnopol, Silesia (including Teschen Silesia).

Except in the extreme south, the country presents the appearance of an almost unbroken plain, composed partly of gently undulating expanses, partly of rich alluvial flats, partly of sandy tracts, and partly of extensive morasses. Its principal streams are the Vistula, Niemen, Dniester, and Bug, with many other rivers. About 85% of the total area is productive. Of the productive area about 25% is forest, and of the remainder one-half is arable and the rest pasture and meadows. Poland is rich in minerals, including coal and brown coal, iron, salt, rock oil, potassium salts, petroleum, etc. Textiles and the manufacture of paper of various kinds are among the important industries.

Government.—The constitution of the Polish republic, adopted March 17, 1921, provides for two houses, a Diet and a Senate, both elected by general suffrage, and a President, chosen by the parliament. The franchise is universal for both sexes.

Army.—Every able-bodied citizen is liable to serve in the army. There were 1,000,000 men under arms in 1920, but the peace strength is about 200,000.

Religion, Education, etc. There is no established church in Poland, but the great majority of the people are Roman Catholics. Elementary education is free and compulsory. There are universities at Cracow, Warsaw, Lemberg, Posen, and Lublin.

At the outbreak of the European war in 1914 only one portion of Poland had autonomous government, namely, that annexed by Austria. Austrian Poland was governed by the Galician Diet at Lemberg, under control of the central Vienna government. During the war Russian Poland was invaded by the Germans and Austrians, and by the end of 1915 the whole country was occupied by the Austro-German forces. On Nov. 9, 1918, the independence of Poland was proclaimed, and General Pilsudski became president. Paderewski, the famous pianist, was premier of the republic in 1919. During 1920 war between Poland and Soviet Russia raged. Boundary disputes led to hostilities between Poland and Lithuania, and Vilna was occupied by the Poles. In March, 1923, the allied council of ambassadors validated Poland's claim to Vilna and eastern Galicia.

The Poles, like the Russians, are a Slavonic race, and are first spoken of as the Polani, a tribe or people between the Vistula and Oder. The country was divided into small communities until the reign of Mieczyslaw I (962-992) of the Piast dynasty, who renounced paganism in favor of Christianity, and was a vassal of the German emperor. He was succeeded by Boleslaw the Great (992-1025), who raised Poland into an independent kingdom and increased its territories. In succeeding reigns the country was involved in war with Germany, the heathen Prussians, the Teutonic knights, and with Russia. The last of the Piast dynasty was Casimir the Great (1333-70), during whose reign the material prosperity of Poland greatly increased. He was succeeded by his nephew, Louis of Anjou, king of Hungary, whose daughter, Hedwig, was recognized as 'king' in 1384, and having married Jagello, prince of Lithuania, thus established the dynasty of the Jagellons, which lasted from 1386 to 1572. During this period Poland attained its most powerful and flourishing condition. In 1572 the Jagellon dynasty became extinct in the male line, and the monarchy, hitherto elective in theory, now became so in fact. The more important of the elective kings were Sigismund III (1587-1637), Ladislaus IV (1632-48), John Casimir (1648-69), and the Polish general Sobieski, who became king under the title of John III (1674-96). He was succeeded by Augustus II, Elector of Saxony, who got entangled in the war of Russia with Charles XII, and has as a rival in the kingdom Stanislaus Lesczynski. Augustus III (1733-63) followed, and by the end of his reign internal dissensions and other causes had brought the country into a state of helplessness. In 1772, under the last feeble king, Stanislaus Augustus (1764-95), the first actual partition of Poland took place, when about a third of its territories were seized by Prussia, Austria and Russia, the respective shares of the spoil being Prussia 13,415 square miles, Austria 27,000

square miles, and Russia 42,000 square miles. What remained to Poland was completely under Russian influence. Another partition in 1793 gave Russia nearly 97,000 square miles and Prussia 22,500 square miles. A third partition took place in 1795 after the heroic attempt of Kosciusko to save his country, and the last king of Poland became a pensionary of the Russian court.

Language and Literature.—Polish belongs to the western branch of the Slavonic group of languages, which includes also the Bohemian. Polish literature is older than any other Slavonic language except the Bohemian. The oldest monuments consist of warlike, historical, political and religious poems, more especially the latter class; but the Latin language, fostered by the church, was used exclusively by Polish writers for several centuries. The 'golden age' of Polish literature was from 1521 to 1621. To this period belong Nicolas Rej (1505-69) and Jan Kochanowski (1530-84), who both attained eminence as poets, the former in satire, allegory, didactic poetry, etc., the latter as a lyrist of the highest rank. Among the other poets of the century were Szarzynski (died 1581), and Szymonowicz, the author of *Polish Idylls.* The most distinguished authors of the latter part of the eighteenth century are Naruszewicz, who wrote odes, idylls, satires, etc., and Krasicki (1735-1801), who also distinguished himself in various fields. Among modern Polish poets may be noted Michiewicz (1798-1855), Slowacki (1809-49), Zaleski (1802-86), Krasinski (1812-59), one of Poland's most notable poets; and Sienkiewicz (q. v.) internationally known for his *Quo Vadis.* Most departments of literature have been successfully cultivated by modern Polish writers, but comparatively few have attained an American reputation.

Polar Bear. See *Bear.*

Polar Circles, two imaginary circles of the earth parallel to the equator, the one north and the other south, distant 23° 28′ from either pole. See under *Arctic.*

Polar Coördinates. See *Coördinates.*

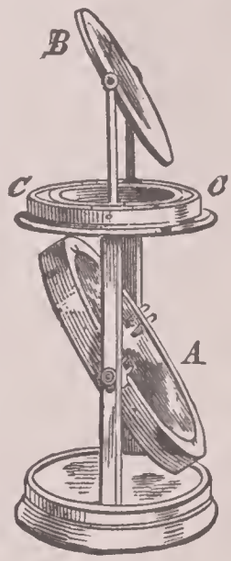
Polar Distance, the angular distance of any point on a sphere from one of its poles; more especially the angular distance of a heavenly body from the elevated pole of the heavens. It is measured by the intercepted arc of the circle passing through it and through the pole, or by the corresponding angle at the center of the sphere. According as the north or south pole is elevated we have the *north polar distance* or the *south polar distance.*

Polar Expeditions. See *North Polar Expeditions* and *South Polar Expeditions.*

Polar Forces, in physics, forces that are developed and act in pairs with opposite tendencies, as in magnetism, electricity, etc.

Polaris (pō-lar′is), the pole-star, which see.

Polariscope (pō-lar′is-kop), an optical instrument, various kinds of which have been contrived, for exhibiting the polarization of light, or for examining transparent media for the purpose of determining their polarizing power. The important portions of the instrument are the polarizing and analyzing plates or prisms, and these are formed either of natural crystalline structures, such as Iceland spar and tourmaline, or of a series of reflecting surfaces, artificially joined together. The accompanying figure shows Malus' polariscope. A and B are the reflectors, the one serving as polarizer, the other as analyzer, each consisting of a pile of glass plates. Each reflector can be turned about a horizontal axis, and the upper one, or analyzer, can also be turned about on a vertical axis, the amount of rotation being measured on the horizontal circle C C. See *Polarization of Light.*

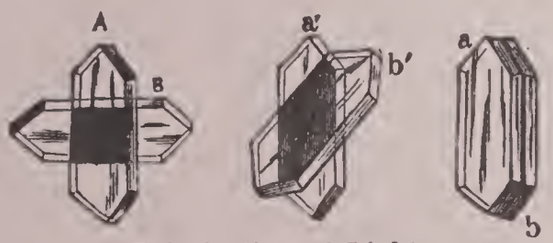


Polariscope.

Polarity (pō-lar′i-ti), that quality of a body in virtue of which peculiar properties reside in certain points called poles; usually, as in electrified or magnetized bodies, properties of attraction or repulsion, or the power of taking a certain direction; as, the *polarity* of the magnet or magnetic needle, whose pole is not that of the earth, but a point in the polar regions. A mineral is said to possess *polarity* when it attracts one pole of a magnetic needle and repels the other.

Polarization of Light, an alteration produced upon light by the action of certain bodies by which it is made to change its character. A common ray of light exhibits the same properties on all sides, but any reflected or refracted ray, or a ray transmitted through certain media, exhibits different properties on different

sides, and is said to be polarized. The polarization of light may be effected in various ways, but chiefly in the following: — (1) By reflection at a proper angle (the 'polarizing angle') from the surfaces of transparent media, as glass, water, etc. (2) By transmission through crystals possessing the property of double refraction, as Iceland spar. (3) By transmission through a sufficient number of transparent uncrystallized plates placed at proper angles. (4) By transmission through a number of other bodies imperfectly crystallized, as agate, mother-of-pearl, etc. The knowledge of this singular property of light has afforded an explanation of some interesting phenomena in optics. A simple example of polarization may be illustrated by two slices of the semitransparent mineral tourmaline cut parallel to the axis of the crystal. If one is laid upon the other in the positions A B (see fig. below) they form an opaque combination. If one is turned round upon the other at various angles it will be found that greatest transparency is produced in the



Polarization of Light.

position corresponding with *a b* (which represents the natural position they originally occupied in the crystal), an intermediate stage being that shown at *a' b'*. The light which has passed through the one plate is polarized, and its ability to pass through the other plate is thus altered. Reflection is another very common cause of polarization. The *plane of polarization* is that particular plane in which a ray of polarized light incident at the polarizing angle is most copiously reflected. When the polarization is produced by reflection the plane of reflection is the plane of polarization. According to Fresnel's theory, which is that generally received, the vibrations of light polarized in any plane are perpendicular to that plane. The vibrations of a ray reflected at the polarizing angle are accordingly to be regarded as perpendicular to the plane of incidence and reflection, and therefore as parallel to the reflecting surface. Polarized light cannot be distinguished from common light by the naked eye; and for all experiments in polarization two pieces of apparatus must be employed — one to produce polarization, and the other to show it. The former is called a *polarizer*, the latter an *analyzer;* and every apparatus that serves for one of these purposes will also serve for the other. One such apparatus is shown in the article *Polariscope*. The usual process in examining light with a view to test whether it is polarized, consists in looking at it through the analyzer, and observing whether any change of brightness occurs as the analyzer is rotated. There are two positions, differing by 180°, which give a minimum of light, and the two positions intermediate between these give a maximum of light. The extent of the changes thus observed is a measure of the completeness of the polarization of light. Very beautiful colors may be produced by the peculiar action of polarized light; as for example, if a piece of selenite (crystallized gypsum) about the thickness of paper is introduced between the polarizer and analyzer of any polarizing arrangement and turned about in different directions it will in some positions appear brightly colored, the color being most decided when the analyzer is in either of the two critical positions which give respectively the greatest light and the greatest darkness. The color is changed to its complementary by rotating the analyzer through a right angle; but rotation of the selenite, when the analyzer is in either of the critical positions, merely alters the depth of the color without changing its tint, and in certain critical positions of the selenite there is a complete absence of color. A different class of appearances is presented when a plate, cut from a uniaxial crystal by sections perpendicular to the axis. is inserted between the polarizer and the analyzer. Instead of a broad sheet of uniform color, there is exhibited a system of colored rings, interrupted when the analyzer is in one of the two critical positions by a black or white cross. Observation of this phenomenon affords in many cases an easy way of determining the position of the axis of the crystal, and is therefore of great service in the study of crystalline structure. Crystals are distinguished as dextrogyrate or lævogyrate, according as their colors ascend by a right-handed or left-handed rotation of the analyzer horizontally. Glass in a state of strain exhibits coloration when placed between a polarizer and analyzer, and thus we can investigate the distribution of the strain through its substance. Unannealed glass is in a state of permanent strain. A plate of ordinary

glass may be strained by a force applied to its edges by means of a screw. The state of strain may be varied during the examination of the plate by polarized light. A plate of quartz (a uniaxial crystal) cut at right angles to the optic axis exhibits, when placed between an analyzer and polarizer, a system of colored rings like any other uniaxial crystal; but we find that the center of the rings, instead of having a black cross, is brightly colored — red, yellow, green, blue, etc., according to the thickness of the plate.

Polder (pōl'dèr), the name given in the Netherlands to an area of land reclaimed from the sea, a marsh, or a lake by artificial drainage, protected by dykes, and brought under cultivation. The polders were for the most part formerly permanently submerged areas. The usual method of procedure in the formation of a polder is to enclose the portion to be reclaimed by an embankment, and construct a channel having its bed sufficiently high to cause a current towards the sea or river. The water is then pumped into this canal by means of apparatus driven by steam or otherwise. See *Netherlands*.

Pole (pōl), the name given to either extremity of the axis round which the earth revolves. The northern one is called the *north pole*, and the southern the *south pole*. Each of these poles is 90° distant from every part of the equator. In astronomy, the name is given to each of the two points in which the axis of the earth is supposed to meet the sphere of the heavens, forming the fixed point about which the stars appear to revolve. In a wider sense a pole is a point on the surface of any sphere equally distant from every part of the circumference of a great circle of the sphere; or a point 90° distant from the plane of a great circle, and in a line passing perpendicularly through the center, called the axis. Thus the zenith and nadir are the *poles* of the horizon. So the *poles* of the ecliptic are two points of the sphere whose distance from the poles of the world is equal to the obliquity of the ecliptic, or they are 90° distant from every part of the ecliptic. *Pole*, in physics, is one of the points of a body at which its attractive or repulsive energy is concentrated, as the poles of a magnet, the north pole of a needle, as in the compass, or the poles of a battery.

Pole, Perch, or Rod, a measure of length containing $16\frac{1}{2}$ feet or $5\frac{1}{2}$ yards. Sometimes the term is used as a superficial measure, a square pole denoting $5\frac{1}{2}$x$5\frac{1}{2}$ yards, or $30\frac{1}{4}$ square yards.

Pole, Reginald, cardinal and statesman, born in Staffordshire in 1500; died in 1558. He was the son of Sir Richard Pole, Lord Montacute, cousin to Henry VII, by Margaret, daughter of the Duke of Clarence, brother to Edward IV. He was educated at Oxford, and had several benefices conferred on him by Henry VIII, with whom he was a great favorite. In 1519 he visited Italy, and fixed his residence at Padua. He returned to England in 1525, but about 1531 lost the favor of Henry by his opposition to the divorce of Queen Catherine. He retired to the continent for safety, was attainted, and his mother and brother were executed. On the accession of Mary (1553) he returned to England as papal legate, and on the death of Cranmer became Archbishop of Canterbury, and was at the same time elected chancellor of the universities of Oxford and Cambridge. He died in Lambeth Palace the day after Mary's death. He seems to have been noted for his mildness, generosity, and comparative moderation, in an age when persecution was deemed lawful on all sides.

Pole-axe, an axe attached to a pole or handle of which the length varies considerably. It was formerly used by mounted soldiers, and in the navy for boarding purposes.

Polecat (pōl'kat), a name common to several species of digitigrade carnivora of the weasel family (Mustelidæ). The common polecat (*Mustēla putorius* or *Putorius fœtidus*) is found in most parts of Europe. Its body is about 17 inches long, and the tail 6 inches. The color is dark brown. It is a nocturnal animal, sleeping during the day and searching for its prey at night. It is especially destructive to poultry, rabbits, and game, as pheasants, so that in Britain it is being rapidly exterminated by gamekeepers, farmers, and others. Frogs, toads, newts, and fish are often stored as food by this voracious animal. It has glands secreting a fetid liquor, somewhat like that of the American skunk, which it ejects when irritated or alarmed. The name of 'Foumart' is also applied to the polecat; and its fur, which is imported in large quantities from Northern Europe, is known as that of the 'Fitch.' Its hairs form a superior kind of artists' brushes.

Polemics (pō-lem'ikz), the art or practice of disputation generally, but in a special sense that branch

of theological learning which pertains to the history or conduct of ecclesiastical controversy.

Polemoniaceæ (pol-e-mon-i-ā'se-ē), a natural order of monopetalous exogens with a trifid stigma, three-celled fruit, and seeds attached to an axile placenta, the embryo lying in the midst of albumen. They consist for the most part of gay-flowered, herbaceous plants, natives of temperate countries, and particularly abundant in the northwestern parts of America. They are of no economical importance. Some are cultivated for their beauty, the well-known phlox being one.

Polemoscope (po-lem'u-skōp), a sort of stand or frame high enough to rise above a parapet or other similar object, having a plane mirror at top so fitted as to reflect any scene upon another mirror below, and thus enable a person to see a scene in which he is interested without exposing himself.

Polenta (pō-len'ta), a preparation of either semolina, Indian corn, or chestnut-meal, made into a porridge and variously flavored; a common article of diet in Italy and France. It is allowed to boil until it thickens, and is then poured into a dish, where it becomes firm enough to be cut into slices.

Pole-star, the star *a* of the constellation Ursa Minor, situated about 1° 20′ from the north celestial pole, round which it thus describes a small circle. It is of the second magnitude, and is of great use to navigators in the northern hemisphere. Two stars called the pointers, in the constellation Ursa Major (the Great Bear, commonly called the Plow), always point in the direction of the pole-star, and enable it to be found readily.

Polianthes (pol-i-an'thus), a genus of plants belonging to the nat. order Amaryllidaceæ. They are natives of the East Indies and S. America, and mostly require the aid of artificial heat, under shelter of frames and glasses, to bring them to flower in perfection. The *P. tuberosa* or *tuberose* is well known for its delicious fragrance. See *Tuberose.*

Police (po-lēs'), the system instituted by a community to maintain public order, liberty, and the security of life and property. In its most popular acceptation the *police* signifies the administration of the municipal laws and regulations of a city or incorporated town or borough. The primary object of the police system is the prevention of crime and the pursuit of offenders; but it is also subservient to other purposes, such as the suppression of mendicancy, the preservation of order, the removal of obstructions and nuisances, and the enforcing of those local and general laws which relate to the public health, order, safety and comfort. The term is also applied to the body of men by which the laws and regulations are enforced. A police force may be either open or secret. By an open police is meant officers dressed in their accustomed uniform, and known to everybody; while by a secret police is meant officers whom it may be difficult or impossible to distinguish from certain classes of citizens, whose dress and manners they may think it expedient to assume, in order that they may the more easily detect crimes, or prevent the commission of such as require any previous combination or arrangement. This latter class of officer is termed in Britain and America a *detective.* See *Constable.*

Police Burgh. See *Burgh.*

Policinello. See *Punchinello.*

Policy of Insurance. See *Insurance.*

Polignac (pol-in-yȧk), Jules Auguste Armand Marie, Prince de, a French statesman, belonging to an ancient French family, born at Paris in 1780; died at St. Germain in 1847. After the restoration he was appointed adjutant-general to the king, and entered the chamber of peers. In 1820 he obtained from the pope the title of a Roman prince. In 1823 he succeeded Châteaubriand as ambassador at London; but after the accession of Charles X spent the greater part of his time in Paris. He was successively minister of foreign affairs and president of the council. At the revolution of 1830 he was apprehended and condemned to perpetual imprisonment. He remained in the fortress of Ham till the amnesty of 1836 allowed him to take up his residence in England. He was ultimately permitted to return to France. He was the author of *Considérations Politiques* (1832). Several other members of the family were men of some note.

Polignano (po-lē-nyä'no), an Italian town, province of Bari, on the Adriatic, 26 miles E. S. E. of Bari, on the Bari-Brindisi railway. There is a trade in lemons and oranges. Pop. 8341.

Polillo (pō-lēl'yō), one of the Philippine Islands, E. of Luzon; length, 30 miles; breadth, 20 miles. Rice, maize, sesame, cotton, hemp and timber are produced.

Polishing (pol'ish-ing) is the name given to the process by

which the surface of a material is made to assume a perfectly smooth and glossy appearance, usually by friction. The article to be polished must first be made smooth and even, after which the polishing begins. In the case of wood the process is commonly effected by rubbing with French polish (which see). In metals, by polishing-steel or bloodstone, or by wood covered over with leather, and on which pulverized tripoli, chalk, tin-putty, etc., is sprinkled. In glass and precious stones, by tin-putty and lead siftings; in marble, by tin-putty and tripoli; in granite and other hard stones, by tripoli and quicklime.

Polishing-powder, a preparation of plumbago for polishing iron articles; also a composition variously made up for cleaning gold and silver plate. See *Plate-powder.*

Polishing-slate, a gray or yellowish slate, composed of microscopic infusoria, found in the coal-measures of Bohemia and in Auvergne, and used for polishing glass, marble and metals.

Politian (po-lish'e-an), Angelo Ambrogini, an Italian scholar, known also as *Poliziano* or *Politianus*, born in 1454; died in 1494. The first production which brought him into notice was a Latin poem on the tournament of Giulio de Medici. He assumed the ecclesiastical habit, and acquired the favor of Lorenzo de' Medici, who made him tutor to his children, and presented him with a canonry in the cathedral of Florence. In 1484 he visited Rome, and after his return to Florence he lectured with distinguished success on the Latin and Greek languages, and likewise on philosophy. He wrote an *Account of the Conspiracy of the Pizza;* a Latin translation of Herodian; and a collection of Greek Epigrams; besides Latin odes and epigrams, and a Latin poem entitled *Rusticus.* He also contributed greatly to the correction and illustration of the *Pandects.*

Political Economy, the science of the social ordering of wealth, or the science which has as its aim the investigation of the social conditions regulating the production, distribution, exchange, and consumption of wealth, the term wealth being understood to mean all articles or products possessing value in exchange. While, however, political economy is susceptible of wide definition on these lines, the exact scope of the science within the terms of the definition has been the subject of much confused debate. From the nature of the actual conditions of the production and regulation of wealth, and the place of the systematic examination of these as departmental to a larger science investigating the natural laws of the formation and progress of civilized communities, it is impossible to sunder it entirely from physical, intellectual, and moral considerations tending to enlarge indefinitely its scope. The varying extent to which these elements have entered into the treatment of the subject by economists has given rise to controversy not only as to whether economics is to be considered as a physico-mental or a purely mental science, but even as to its claim to be considered an independent science at all. By most economists it is urged, that as the reasoned and systematic statement of a particular class of facts it may rightly claim to be considered a science, while, as dealing with inanimate things only incidentally as the measure of motives of desire, it is to be classed with the moral or social sciences. Of more importance, as affecting the whole history of the science, have been the questions arising from the method employed in economic inquiry. The modern English school of economists, including the names of Adam Smith, Ricardo, Mill, Cairns, Fawcett and Marshall, have been mainly guided by the deductive method, its more extreme representatives, such as Senior, asserting this method to be the only one applicable to the science. In point of fact political economy has necessarily availed itself of both methods. It has been deductive in so far as it has assumed at the outset certain hypotheses, and derived from these by a dialectical process the guiding principles of the science; but even the older economists, working under the immediate influence of the mathematico-physical sciences chiefly, cannot be justly accused of having overlooked, though they tended to underestimate, the necessity of supplementing deduction by induction. The hypothesis on which the economic system was founded, was that in the economic sphere the principal motive of human action was individual self-interest, leading men to seek to obtain the greatest amount of wealth with the least expenditure of effort; this hypothesis being followed out to its logical conclusions, under assumed conditions of perfectly free competition, in connection with the facts of the limitations of the earth's extent and productiveness, and the theory of a tendency in the race to multiply to an incalculable extent in the absence of natural or artificial obstacles. On this basis theories of value, rent, and population were formed having the character of laws, but of laws which were hypothetical merely

— true only under the assumed conditions of an environment in which competition was free and frictionless, unhampered by inertness, ignorance, restrictive customs, and the like. In this respect the method adopted and the results arrived at found analogy in those physical sciences the laws of which are only applicable in actual fact under large and variable modification. There was, however, an indisputable tendency among the earlier economic writers to regard these hypothetical laws as in a greater degree representative of actual fact than they were, and even, when the actual facts fell short of the theoretic conditions, to regard these as prescriptive and regulative. The ethical protest against this tendency found a strong support in the development of the group of biological sciences, opening up new conceptions of organic life and growth; and as the result of these and other influences the old rigidity in the application of theory has largely disappeared. Where the older economist tended to look upon the subject matter of economics as more or less constant and furnishing laws of universal application, the modern economist, having regard to the complexity and variability of human motives and the development of the race both in the matter of character and institutions has come to recognize that the abstract conception of a frictionless competitive atmosphere, in which self-interested motives worked with mechanical regularity, can never bear other than a qualified application to actual economic conditions, and that laws relating to the economic aspects of life at one stage of human development seldom apply at another without large modification. He realizes clearly what the older economists only imperfectly perceived, and even more imperfectly expressed, that the system they were elaborating was to be considered rather as an instrument to assist in the discovery of economic truth than a body of truths representing any actual or desirable social state. When regarded in this light — as a means to assist in the disentanglement of the complex motives operative in actual economic relations — the isolation of one set of economic forces, and the tracing of the logical issues of these become of the highest value, despite the danger in careless use of neglecting necessary modification and of translating its hypothetic statements into prescriptions for conduct and social organization. It has been this neglect, the assumption of didactic authority, and the extent of the modifications often necessary in the practical application of theory which have tended to bring the older school into discredit at the hands of Comte, Cliff Leslie, Ruskin, and a large number of foreign economists — some complaining with Comte of the tendency to vicious abstractions, and the impossibility of isolating to any useful end the special phenomena of economics from other social phenomena; some, like the German and American historic schools, arguing that it is desirable and necessary to reason direct from historic facts to facts without the intervention of any formal economic theory. So far, however, the opponents of the older method of dealing with economic problems, though they have accomplished an admirable work in clearing the older economics of many confusions and misapprehensions, have failed to supply a superior method of analyzing the phenomena constituting the subject matter of the science, while many of them have not scrupled to avail themselves largely of the results arrived at by the method they condemn. On the grounds of difference in method, and in conception of the scope of the science, the economists of to-day may be classified as forming four principal groups: —

1. The modern orthodox philosophic school, working, as indicated above, on the basis of a body of hypothetical principles, constituting the statics of exchange and distribution, deductively arrived at by the consideration of the operations of motives of self-interest in an environment of free and frictionless competition — principles imperfectly representing actual economic conditions, but of assistance, under due precautions, in the accurate analysis of these.

2. A group of mathematical economists allied to the philosophic school as working on the deductive basis, and largely engaged in translating philosophic theory into symbolic formulæ for retranslation into theory.

3. The historical school, denying the value of deductive economics, and seeking to confine the work of the economist to the description of the various stages of economic civilization as they have arisen, and the indication, under due conditions of time, place, and natural development, of such relative principles as may be discoverable in them.

4. A group of economic students who approach political economy from the point of view of a previous training in 'the sciences of inorganic and vital nature' (physics and biology as opposed to metaphysics), and who wish to include within the scope of economics the consideration of wealth as measured, not by subjective emotions and desires, but by the objective utility of things, the part played by their

in the maintenance and evolution of society, the definitely determinable capacities they may possess of supplying physical energy and improving the physiological constitution of the race. From this point of view, economics is to be regarded as 'the direct study of the way in which society has actually addressed itself, and now addresses itself, to its own conservation and evolution through the supply of its material wants' (Ingram) — a study, therefore, inseparable from the study of sociology as a whole, and to be followed up under the immediate guidance or bias of a moral synthesis and a therapeutic aim.

The general scope of the science from the neo-orthodox standpoint may be broadly indicated under four heads: —

I. Production: dealing with the requisites of production — Land (natural agents), Labor, and Capital; the law of fertility of land (Law of Diminishing Returns); the laws of the growth of population and capital; the organization of industry, division of labor, etc.

II. The pure theory of values or theory of normal (natural) values, *i. e.*, of values as they would arise in a market where competition was free and undisturbed. Under this head are discussed the relations of value and utility; the laws of supply and demand; cost and expenses of production; the law of rent and the relation of rent to value; the considerations determining the normal share of the various classes of producers in the value of the product; the laws of supply and demand in relation to skilled and unskilled labor and to capital; the laws of wages and earnings, etc.

III. The application of the pure theory of values under the conditions of actual trade — internal and international; treating of the medium of exchange; the influence of changes in the purchasing power of money; influence of modern credit systems; the influence upon prices and wages and profits of local customs, monopolies, combinations, trades unions, coöperation, etc.; the conditions of foreign exchange; the competition of different countries in the same market, and the like.

IV. The economic functions and influence of government: dealing with Taxation, direct and indirect; the opposing principles of Protection and Laisser-faire, etc.

In the last division the treatment inevitably takes the form not merely of setting forth what is, but of discussing what ought to be; in other words, the method is no longer that of a science aiming at the systematized representation of facts, but rather that of an art, seeking to prescribe and regulate for ethical and prudential reasons the industry and commerce of nations. In this respect a large portion of the discussions usually ranged under this head might well be considered as forming with certain other pressing problems of economic reform a distinct branch of the subject, which may be provisionally described as prescriptive or regulative or therapeutic economics. To this branch would belong the various problems touching the fair share of the different productive classes in the value of the product, and indeed the investigation of the whole question of property in relation to the various schemes of distribution — individualistic, socialistic and communistic. The frequent mixture of these considerations of practical economic reform with the non-moral and indifferent systematization of contemporary economic fact has been a most fertile source of confusion and misunderstanding.

As a separate scheme of knowledge meriting the title of a science, political economy is little more than a century old, but the germs of modern economic doctrines are to be traced long previous. In Greece, Plato, Xenophon and Aristotle alike conducted investigations in economics from an ethical point of view and in subordination to the theory of the state, the last, however, showing a perception of the difference between value in use and value in exchange, of the advantages of division of labor, of the functions of money as a measure of value and an instrument of exchange, of the desirability of maintaining a proportion between population and territory. The Romans followed, without advancing upon, the economics of the Greeks. Cicero opposed manufactures and trade, upholding, in the main, like Cato and Varro, an agrarian ideal; Pliny condemned the effects of servile labor and the exportation of money, and discussed some of the problems connected with value. After the fall of Rome it is not till the latter part of the middle ages that we find the emancipation of the towns and the development of the burgher class admitting of industry and commerce on a wide scale. In the thirteenth century St. Thomas Aquinas paraphrased the doctrines of Aristotle on money and interest, establishing on them a condemnation of interest. His influence lasted into the next century, among the principal writers of which were Bartolo di Sassoferrato, Jean Buridan and Nicolas Oresme, the latter the author of the fullest treatise on money written up till his time. Gabriel Biel, F. Patrizzii, and

Diomede Caraffa are the chief names of the fifteenth century, the study of economics being chiefly pursued by ecclesiastics until the collapse of mediævalism in the sixteenth century. The main economic topics continued to be the nature and functions of money, the legitimacy of usury, institutions of credit, and monti di pietà. Chief among the sixteenth century writers are the names of Jean Bodin in France, and in England the writer W. S. (probably William Stafford), who worked in part from Bodin, Sir Walter Raleigh, Gilbert, Hackluyt and Peckham. The characteristic doctrines developed at this time came to be known as the mercantile system, or Colbertism, and found expression in the close of the sixteenth and beginning of the seventeenth centuries chiefly in the writings of Antonio Serra in Italy, Antoine de Montchrétien in France, and Thomas Mun in England. They were opposed by a few early advocates of free trade, including Emérique de Lacroix in France and Alberto Struzzi in Spain. In the second half of the seventeenth century considerable advancement was made by Hobbes, Locke, Sir Joshua Child, Sir William Petty and Sir Dudley North, and the foundation of the Bank of England gave rise to much controversy early in the eighteenth century, leading to more enlarged conceptions of the operations of credit. In France Boisguillebert and Vauban opposed Colbertism, and Montesquieu endeavored to work out the economics of government finance. The foundation of the physiocratic school by Quesnay was, however, the chief economic movement of the eighteenth century in France, among its exponents being the elder Mirabeau, De la Rivière, Baudeau, Le Trosne, Dupont de Nemours, Gournay, and especially Turgot, the greatest of the group. It made some little way in Italy and Germany; but its direct influence was not marked in England, where Hume's *Economic Essays* were followed by Adam Smith's epoch-making *Wealth of Nations*, directed against mercantilists and physiocrats alike. New elements were introduced by the population theory of Malthus, and the theory of rent enunciated by Ricardo on the lines indicated by Anderson and West; and the statistical side was developed by Thomas Tooke. In reducing the teaching of Adam Smith to system, the French economist Say played an influential part, and the work was advanced still further by the labors of Torrens, James Mill, McCulloch, Whately, Senior, and other minor writers. No work, however, after the *Wealth of Nations* exercised so wide an influence as that of Jonn Stuart Mill, who despite the signs of revolt, to which allusion has been made, still dominates popular economic thought for good and ill. The names of Longe, Leslie, Thornton, and Cairnes may be noted among the earlier critics or commentators of Mill; while Marshall, working on the basis of Mill, has more accurately defined the limitations of the deductive method in seeking to formulate and apply a pure theory of values Among other recent writers of importance have been W. Stanley Jevons (mathematical and statistical group), Carl Marx (Socialist), Roscher (historical), Sidgwick (eclectic), and Ingram (Positivist). The Socialistic and Anarchistic hypotheses are two modern views concerning the distribution of wealth and ownership of property which are (especially the former) attracting wide attention.

Political Offenses, are those offenses considered injurious to the safety of the state, or such crimes as form a violation of the allegiance due by a subject to the recognized supreme authority of his country. In modern times the crimes considered political offenses have varied at different periods and in different states. In Britain the most serious political offenses are termed treason (see *Treason* and *Treason-Felony*), and those of a lighter nature, which do not aim at direct and open violence against the laws or the sovereign, but which excite a turbulent and discontented spirit which would likely produce violence, are termed sedition. (See *Sedition.*) Political offenders of foreign countries are by English law not included in extradition treaties. In the United States also, and in most of the countries of Europe, the extradition treaties do not include the giving up of political offenders.

Political Parties, divisions of people in a state marked off by the particular views they hold as to the public policy to be pursued in the best interests of the people at large. In the United States the chief political parties at present are the *Democrats* and *Republicans*, the former favoring a tariff for revenue only, the latter a tariff for the protection of industries. Various minor parties have from time to time arisen, but the principles advocated by the two parties named have been prominent throughout nearly the whole history of the country.

In the normal condition of British politics there are but two political parties, the *Liberal* and the *Conservatives* or

Tories. The former are distinctively advocates of progressive reform, and are subclassed as *Whigs* or *Radicals*, according as their views are moderate or advanced. The Irish question has for the present created two other parties by a division on different lines, *Home Rulers* and *Unionists*, that is, those advocating an Irish legislature for home affairs, and those opposing this view. French political parties are broadly divided into *Republicans* and *Reactionaries*, both of which are subdivided into numerous antagonistic sections, the latter including *Bonapartists* and *Monarchists*, or those who favor a restoration of the old monarchy. In German politics there are the *Ultramontanes*, the *Conservatives*, the *Reichspartei* or *Imperialists*, the *National Liberals*, the *Progressists*, the *Social Democrats*, the *Volkspartei* or *Democrats*, etc.

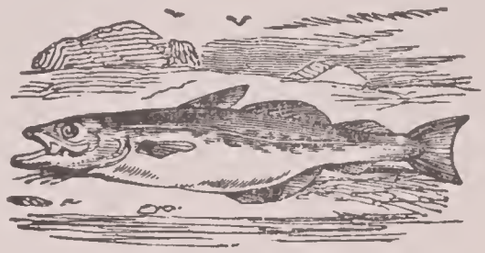
Politics (pol'i-tiks), in its widest extent, is both the science and the art of government, or the science whose subject is the regulation of man in all his relations as the member of a state, and the application of this science. In other words, it is the theory and the practice of obtaining the ends of civil society as perfectly as possible. In common parlance we understand by the politics of a country the course of its government, more particularly as respects its relations with foreign nations.

Poliziano. See *Politian*.

Polk (pōk), James Knox, president of the United States from 1845-49, was born in 1795 in North Carolina; died at Nashville in 1849. He studied law and entered Congress as representative of Tennessee in 1825. He was Speaker of the House of Representatives from 1835 to 1839, when he was elected Governor of Tennessee, but was defeated for this office in 1841. His advocacy of the annexation of Texas led to his nomination by the Democratic party for the Presidency in 1844, Henry Clay being the Whig candidate. The contest was a very close one, but Polk was elected. The annexation of Texas, the Mexican war, the acquisition of Upper California and New Mexico, and the settlement of the Oregon boundary were the chief events of his term of office.

Polka (pōl'ka), a species of dance of Bohemian origin, but now universally popular, the music to which is in $\frac{2}{4}$ time, with the third quaver accented. There are three steps in each bar, the fourth beat being always a rest.

Pollack (pol'ak); *Merlangus pollachius*) a fish of the cod family. The pollack belongs to the same genus as the whiting (*M. vulgāris*); the members of this genus possessing three dorsal fins and two anals. The lower jaw is longer than the upper jaw, and the tail is forked, but not very deeply. It inhabits the Atlantic Ocean, and is common on all the British coasts, as well



Pollack (*Merlangus pollachius*).

as on the shores of Norway. The northern coasts of Britain appear to be those on which these fishes are most abundant. The pollacks are gregarious in habits, and swim in shoals. They bite keenly at either bait or fly, and afford good eating. Called in Scotland *Lythe*.

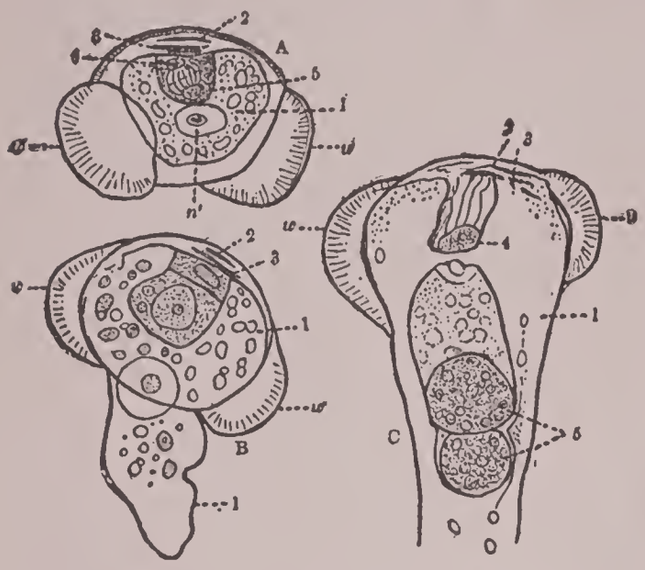
Pollan (pol'an), the 'fresh-water herring' (*Coregŏnus Pollan*), a species of fishes belonging to the Salmonidæ. It is an Irish species, and is found in Lough Erne, Lough Neagh, and Lough Derg. It is generally about 9 or 10 inches in length. There is a Scotch species in Loch Lomond known as the *Powan;* another in Lochmaben, the *Vendace*.

Pollanarrua (pol-la-na-ru'a), a ruined city and formerly capital of Ceylon, situated about 60 miles N.E. of Candy. There are numerous large stone figures of Buddha, and remains of temples and other buildings. It flourished from the eighth to the beginning of the thirteenth century. Called also Topare.

Pollard (pol'ard), the name given to a tree the head of which has been lopped off about 8 or 10 feet from the ground, in order to induce it to send out bushy shoots, which are cut periodically for basket-making, fuel, fencing, or other purposes.

Pollen (pol'en), the male element in flowering plants; the fine dust or powder which by contact with the stigma effects the fecundation of the seeds. To the naked eye it appears to be a very fine powder, and is usually inclosed in the cells of the anther; but when examined with the microscope it is found to consist of hollow cases, usually spheroidal, filled with a fluid in which are suspended drops of oil from the 20,000th to the 30,000th of an inch in diameter, and grains of starch five or six times as

large. Impregnation is brought about by means of tubes (pollen-tubes) which issue



Pollen — Grain of Picea Excelsa.

A, Commencement of germination. B, Further stage, showing pollen-tube. C, more advanced stage.

from the pollen-grains adhering to the stigma, and penetrate through the tissues until they reach the ovary. The cut shows the pollen-grains of (1) manna-ash (*Fraxinus ornus*), (2) clove (*Caryophylus aromaticus*), (3) strong-scented lettuce (*Lactūca virōsa*).

Pollen Grains (magnified).

Pollenza (pol-yen'thȧ), a town of Spain, in the island of Majorca, 28 miles northeast of Palma. It has a fine Jesuit college, partly ruinous; and manufactures of linen and woolen cloth. Pop. 8368.

Pollio (pol'li-o), CAIUS ASINIUS, a Roman of plebeian family, born B.C. 76; died A.D. 4. He took a prominent part in the civil war, and accompanied Julius Cæsar to Pharsalia, and then to the African and Spanish wars. After obtaining the consulship he commanded in Illyria and Dalmatia, and for his victories was honored with a triumph B.C. 39. He afterwards devoted most of his time to literary pursuits, but acted both as a senator and an advocate. His works, consisting of speeches, tragedies, and a history of the civil war in seventeen books, have all been lost. He was the friend of Virgil and Horace, and founded the first public library in Rome.

Pollok (pol'lok), ROBERT, a Scottish poet, was born at Muirhouse, in the parish of Eaglesham, Renfrewshire, in 1799; died at Southampton in 1827. He was educated at Glasgow University, studied divinity, and was licensed as a preacher by the Associate Presbytery of Edinburgh in the spring of 1827. He is the author of a series of *Tales of the Covenanters*, and a blank verse poem, *The Course of Time*, which in spite of many faults has enjoyed a wonderful popularity both in Britain and America. He died of pulmonary disease soon after the publication of his poem.

Pollokshaws (pol-luk-shąz'), a town of Scotland, county of Renfrew, a little to the southwest of Glasgow, on the White Cart. The inhabitants are principally employed in the manufacture of cotton fabrics, iron-founding, engineering, papermaking, etc. Pop. 11,183.

Poll-tax (pōl'taks), a tax levied per head in proportion to the rank or fortune of the individual; a capitation tax. This tax was first levied in England in 1377 and 1380, to defray the expenses of the French war; its collection in 1381 led to the insurrection of Wat Tyler. In the United States a poll-tax (varying from 25 cts. to $3 annually) is levied in about half the states, as a requirement for the suffrage.

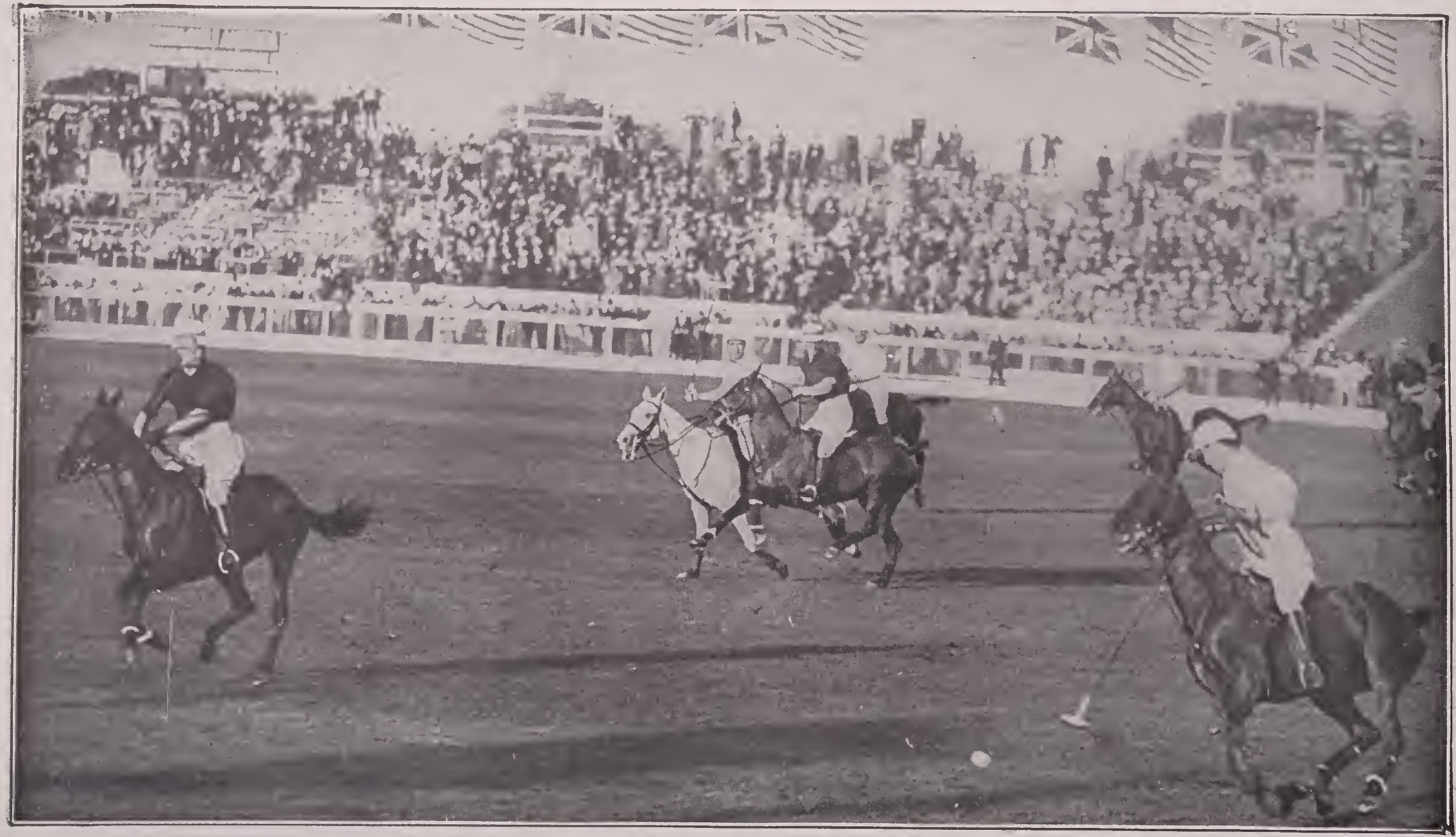
Pollux. See *Castor and Pollux.*

Pollux (pol'luks), JULIUS, a Greek sophist and grammarian, born at Naucratis, Egypt, about the year 135 A.D. He went to Rome during the reign of Marcus Aurelius, who appointed him one of the preceptors of his son Commodus. He wrote several works, all of which have perished except his *Onomasticon*, dedicated to Commodus, and therefore published before 177. This work is of great value in the study of Greek antiquity.

Polo (pō'lō), a game at ball resembling hockey. The players are mounted on ponies, and wield a 'mallet' 4 feet 4 inches in length (a hickory rod with a mallethead at the end). It is played by sides, and the object is to drive the ball from the center of the ground through either of the goals, the side gaining the most goals being the winner.

Polo, GASPAR GIL, a Spanish poet, born at Valencia about 1517; died in 1572. His reputation was established by his *Diana Enamorada*, a pastoral romance, partly in prose and partly in verse. Cervantes excepts the *Diana* of Polo from his list (in *Don Quixote*) of works condemned to be burned. It has been translated into French, English and Latin.

Polo, MARCO, a Venetian traveler, was born about the year 1256. His



POLO

An Incident in an International Polo Match between England and America. The rider at the right of the picture has just struck the ball. In the center of the picture the rider in the dark shirt is "riding off" the player in the white shirt to keep him from aiding his team-mate.

father, Nicolo, was the son of Andrea Polo, a patrician of Venice. Shortly before Marco's birth, Nicolo with his brother Matteo set out on a mercantile expedition, and ultimately arrived at Kemenfu, on the frontiers of China, where they were favorably received by Kubilai, the grand-khan of the Mongols. In 1266 the khan sent the brothers on a mission to the pope, and they arrived in Venice in 1269. Two years later they again set out for the East, this time accompanied by the young Marco. After reaching the court of Kubilai, Marco rapidly learned the language and customs of the Mongols, and became a favorite with the khan, who employed him on various missions to the neighboring princes. Soon afterwards he was made governor of Yang-tchou, in Eastern China, an appointment he held for three years. In 1292 the three Polos accompanied an escort of a Mongolian princess to Persia. After arriving at Teheran they heard of Kubilai's death, and resolved to return home. They reached Venice in 1295. In the following year Marco Polo took part in the naval battle of Curzola, in which he was taken prisoner. During his captivity he dictated to a fellow-prisoner, Rustichello or Rusticiano of Pisa, an account of all his travels, which was finished in 1298. After his liberation he returned to Venice, where he died in 1323. His book — known as the *Book of Marco Polo* — created an immense sensation among the scholars of his time, and was regarded by many as pure fiction. It made known to Europeans the existence of many nations of which they were formerly totally ignorant, and created a passion for voyages of discovery. It has gone through numerous editions in the various European languages, but the best is that of Col. (Sir Henry) Yule, accompanied with a great amount of learned elucidation and illustration. It was originally written in French, but Latin and Italian MSS. of it are more common.

Polonaise (pō-lu-nāz′; Italian, *Polacca*) is a Polish national dance, which has been imitated, but with much variation, by other nations. The *Polonaise*, in music, is a movement of three crotchets in a bar, characterized by a seeming irregularity of rhythm, produced by the syncopation of the last note in a bar with the first note of the bar following, in the upper part or melody, while the normal time is preserved in the bass.

Polonium (pō-lō′ni-um), the name given a radio-active substance discovered by Madame Curie in the researches which led to the discovery of radium. So named from Poland, her native country.

Polotzk (po′lotsk), a town in Russia, government of Vitebsk, at the confluence of the Polotka and the Dwina. The most remarkable edifices are a dilapidated castle built by Stephen Bathory, King of Poland, in the sixteenth century, and the old Jesuit convent and college. It has an increasing trade, especially with Riga, in corn, flax, linseed, etc., and tanning is carried on to some extent. A battle took place here between the Russians and the French in 1812, in which the latter were defeated. Pop. 20,751.

Poltava (pål-tä′vå), or PULTAWA, a government of Russia, bounded by Czernigov, Kharkov, Ekaterinoslav, Kherson and Kiev; area, 19,265 sq. miles. It consists of an extensive and somewhat monotonous flat, watered by several tributaries of the Dnieper. It is one of the most fertile and best cultivated portions of the Russian Empire, and grows large quantities of grain. Live stock and bee rearing are important branches of the rural economy. Both manufactures and trade are of very limited extent. Education is much neglected. Pop. 3,312,400.— POLTAVA, the capital, at the confluence of the Poltava with the Worskla, has straight and broad streets, a cathedral, important educational institutions, etc. As a place of trade Poltava derives importance from the great fair held on July 20th each year. Wool is the great staple of trade. Horses, cattle, and sheep are likewise bought and sold in great numbers. It contains a monument to Peter the Great, who here defeated Charles XII in 1709. Pop. 53,060.

Polyadelphia (pol-i-a-del′fi-a), the name given by Linnæus to the eighteenth class of his sexual system, in allusion to the stamens being collected into several parcels.

Polyandria (pol-i-an′dri-a), or POLYANDRY (Greek *polys*, many, and *anēr*, *andros*, a man) denotes the custom of one woman having several husbands (generally brothers) at one time. This system prevailed among the Celts of Britain in Cæsar's time, and occurs yet in Southern India, in Tibet, among the Eskimo, the Aleutians, some tribes of American Indians, and in the South Seas. The practice is believed to have had its origin in unfertile regions in an endeavor to check the undue pressure of population on the means of subsistence.

Polyandria, in botany, the name given by Linnæus to a

class of hermaphrodite plants having many stamens, generally more than twenty, arising immediately from below the ovary.

Polyanthus (pol-i-an'thus), a beautiful and favorite variety of the common primrose (*Primŭla vulgāris*), a native of most parts of Europe, growing in woods and copses in a moist, clayey soil. The leaves are obovate, oblong, toothed, rugose, and villous beneath. The flowers are in umbels on a scape or flower-stalk 3 to 6 inches or more in length. In addition to propagating from seeds polyanthuses may also be readily increased by division. The seeds should be sown in June. The plants should be potted in August. Some will show flowers the same autumn, and many in the following spring. The plants are very hardy, and require to be transplanted every two years.

Garden Polyanthus.

Polybasic Acids (pol-i-bā'sik), acids which possess more than one hydrogen atom capable of being replaced by a metal equivalent.

Polybius (po-lib'i-us), a Greek historian, was born at Megalopolis, in Arcadia, about 204 B.C.; died in 122. His father, Lycortas, was one of the leaders of the Achæan League, and the confidential friend of Philopœmen. Educated for arms and political life, he entered, at the age of twenty-four years, into the military and political service of the League. After the subjugation of Perseus, king of Macedonia, by the Romans (168), Polybius found himself among the 1000 Achæans summoned to Rome to answer before the senate why the League had not aided the Roman army in Macedonia. While in Italy he formed an intimate friendship with Scipio Æmilianus, whom he accompanied on his African campaign, and witnessed the destruction of Carthage. He returned to Greece in 146, just after the fall of Corinth, and exerted himself successfully to obtain moderate terms from the Romans for his countrymen. His principal work is his *History of Rome*, in forty books, from 220 to 140 B.C., with an introduction giving a sketch of the rise of the city from its conquest by the Gauls to the outbreak of the second Punic war. Only the first five books and fragments of the rest are extant.

Polycarp (pol'i-karp), one of the Christian fathers, and, according to tradition, a disciple of the apostle John, was born probably in Smyrna about 69 or 70; martyred 155 or 156. According to a legendary fragment ascribed to a writer named Pionius, he was consecrated bishop of his native city by St. John. During the persecution under Marcus Aurelius, Polycarp was seized and brought before the Roman proconsul at Smyrna. Having refused to renounce his faith, he was condemned to the flames. He wrote several letters, which were current in the early church, but all have perished except one addressed to the Philippians, which appears to have been written about 115, and is valuable for its quotations from the apostolic writings.

Polychrome Printing. See *Color Printing.*

Polychromy (pol'i-krō-mi), the name given to the art of decorating works of sculpture and architecture with different colors. The custom of painting statues is as ancient as sculpture itself; the Egyptians, Assyrians, Phœnicians, Babylonians, and Persians all painted their statues in various colors, especially in red. Polychromy, however, only reached the dignity of a real art among the Greeks. Instead of employing colors, the sculptors of the age of Pericles generally used marbles of different colors fitted together, and the ornaments of their statues were made of various metals and of ivory. Thus the nude parts were, in some cases, of Persian marble, the draperies of streaked onyx, the eyes of gold or ivory, the shields and other arms of bronze, and so forth. Architectural polychromy may be divided into natural polychromy, in which the materials employed produce certain effects by their natural colors; and artificial polychromy, which is simply the application of coats of paint, whether on the exterior or interior parts of the edifice. Both natural and artificial polychromy were used by the Egyptians, Assyrians, Babylonians, and Persians. Polychromy was cultivated by the Romans in a much more restricted style. In the public buildings of the later Romans gold decorations and facings of variegated stone were used instead of mere colors. In the middle ages polychrome architecture was adopted by the Arabs and Byzantines. A fine example of Byzantine architecture in polychrome style is the Palatine

Chapel at Palermo, erected in 1232. On the establishment of Gothic architecture polychromy was introduced into the interior of churches. This practice was maintained throughout the middle ages.

Polycletus (pol-i-klē′tus) of SICYON, a Greek sculptor and architect, who flourished about 452-412 B.C. His most celebrated statues were the *Doryphorus* ('Spear-bearer'), to which the name of *canon* or model was given; and his statue of *Hera* (Juno) in the temple between Argos and Mycenæ. As an architect he also distinguished himself.

Polycotyledonous Plants (pol-i-kō-ti-lē′do-nus), those plants of which the embryos have more than two cotyledons or seed-lobes. Instances occur in plants of the cruciferous order, and in coniferous plants.

Polycratēs (pol-ik′ra-tēz), a Greek tyrant or absolute ruler of Samos during the time of the elder Cyrus. He made himself master of the island by violence, and having secured absolute sway seized upon several of the neighboring islands and some towns upon the mainland. In 522 B.C. the Persian satrap Oroetes treacherously invited Polycrates to his palace, and there crucified him. Polycrates seems to have had much taste for learning and the arts, and greatly promoted the refinement of the Samians.

Polycystina (pol-i-sis-tē′na), a group of Protozoa, division Rhizopoda, order Radiolaria, consisting of minute organisms allied to the Foraminifera, but their shells are of siliceous matter, while those of the latter are calcareous. The bodies of the Polycystina are composed of a brownish sarcode-matter apparently containing yellow globules, which protrudes in the form of elongated filaments (*pseudopodia*) through apertures in the shells. The Polycystina inhabit the sea-depths, and are abundantly represented as fossil organisms, as in the 'infusorial earth' of Barbadoes.

Polydeucēs (pol-i-dū′sēz), or POLYDEUKĒS, the Greek name of Pollux. See *Castor and Pollux*.

Polydipsia (pol-i-dip′si-a), a term applied to diabetes.

Polyembryony (pol-i-em′bri-o-ni), in botany, a phenomenon occurring, sometimes regularly and sometimes abnormally, in the development of the ovules of flowering plants, consisting in the existence of two or more embryos in the same seed.

Polygala (po-lig′a-la), a genus of plants of the natural order Polygalaceæ. The species abound in milky juice, and are found in most parts of the world. The root of *P. Senĕga* (senega or seneca root or Virginian snake-root) is a stimulating diuretic, useful in pneumonia, asthma, and rheumatism. *P. vulgāris*, the common milkwort, is a beautiful plant, found in dry pastures.

Polygalaceæ (pol-i-ga-lā′se-ē), a natural order of herbs or shrubs, with alternate, exstipulate, simple leaves; irregular hermaphrodite flowers; diadelphous or monadelphous stamens; anthers opening at the apex by a pore or chink. Nearly half the species are comprised in the genus *Polygala*, and are very generally distributed. The plants of this order are mostly bitter, and acid or astringent.

Polygamy (po-lig′a-mi) consists in a man's having more than one wife at the same time. In ancient times polygamy was practiced by all the Eastern nations, and was sanctioned or at least tolerated by their religions. It was permitted to some extent among the Greeks, but entirely disappeared with the later development of Greek civilization. To the ancient Romans and Germanic races it was unknown. It prevailed among the Jewish patriarchs both before and under the Mosaic law. But in the New Testament we meet with no trace of it. Polygamy has never been tolerated among Christians, although the New Testament contains no injunction against it. It is, however, practiced by the Mohammedans and was common among the Mormons of early days, though now prohibited by law. See *Mormons*.

Polyglot (pol′i-glot; Greek, *polys*, many, and *glōtta*, language), a work which contains the same matter in several languages. It is more particularly used to denote a copy of the Holy Scriptures in which two, three, or more translations are given, with or without the original. The first great work of the sort is the *Complutensian polyglot*, prepared under the direction of Cardinal Ximenes, and splendidly printed (1514-17), in 6 folio volumes, at Alcala de Henares, called in Latin *Complutum*, whence the name of the work. It contains the Hebrew text of the Old Testament, with the Vulgate, the Septuagint, a literal Latin translation. and a Chaldee paraphrase (which is also accompanied by a Latin translation). Another celebrated polyglot is that of Antwerp, called the *Royal Bible*, because Philip II of Spain bore part of the cost of publication. It was conducted by the learned Spanish

theologian, Benedict Arias Montanus, assisted by other scholars. It appeared at Antwerp in 8 folio volumes (1569-72). The *Paris polyglot* appeared in 1645, in 10 folio volumes. The *London* or *Walton's polyglot*, in ten languages, appeared in 6 volumes folio, with two supplementary volumes (London, 1654-57). It was conducted under the care of Bryan Walton, afterwards Bishop of Chester, and contains all that is in the *Paris polyglot*, but with many additions and improvements. It contains the original text according to several copies, with an Ethiopic and a Persian translation, and the Latin versions of each. *Bagster's polyglot* (folio, London, 1831) gives eight versions of the Old Testament and nine of the new.

Polygnotus (pol-ig-nō'tus), a Greek painter, who flourished from 450 to 410 B.C. He was a native of the Island of Thasos, and was instructed in his art by his father, Aglaophon. Cimon, the rival of Pericles, brought him to Athens and employed him to decorate the Stoa Pœcilē, or painted portico, at Athens. His works were probably on wood. Polygnotus is represented as being the first who made painting independent of sculpture.

Polygon (pol'i-gon; Greek, *polys*, many, *gōnia*, an angle). In geometry, a plane figure of many angles and sides, or at least of more than four sides. A polygon of five sides is termed a *pentagon;* one of six sides, a *hexagon;* one of seven sides, a *heptagon*, and so on. *Similar polygons* are those which have their several angles equal each to each, and the sides about their equal angles proportional. All similar polygons are to one another as the squares of their homologous sides. If the sides, and consequently the angles, are all equal, the polygon is said to be regular; otherwise, it is irregular. Every regular polygon can be circumscribed by a circle, or have a circle inscribed in it.—*Polygon of forces*, in mechanics, the name given to a theorem which is as follows: — If any number of forces act on a point, and a polygon be taken, one of the sides of which is formed by the line representing one of the forces, and the following sides in succession by lines representing the other forces in magnitude, and parallel to their directions, then the line which completes the polygon will represent the resultant of all the forces.

Polygonaceæ (pol-ig-o-nā'se-ē), a natural order of herbaceous plants, with trigonal fruit, and usually with stipules united into a tube or ochrea, through which the stem passes. They have astringent and acid properties; some are purgative, and a few are acrid. Among the best-known species are rhubarb, the docks, and the sorrels. See *Polygonum*.

Polygonum (pol-ig'o-num), a genus of herbaceous plants, natural order Polygonaceæ. They are found in the temperate regions of Europe, Africa, North America, and Asia. They are herbaceous, rarely shrubby plants, with alternate stipulate or exstipulate leaves, and spikes of small, pink flowers. Several British species are known by the name of persicarias. See *Bistort*, *Buckwheat*, *Knot-grass*.

Polygynia (pol-i-jin'i-a), one of the orders in the fifth, sixth, twelfth, and thirteenth classes of the Linnæan system, comprehending those plants which have flowers with many pistils, or in which the pistils or styles are more than twelve in number.

Polyhedron (pol-i-hē'drun), in geometry, a body or solid bounded by many faces or planes. When all the faces are regular polygons similar and equal to each other the solid becomes a regular body. Only five regular solids can exist, namely, the tetrahedron, the hexahedron, the octahedron, the dodecahedron, and the icosahedron.

Polyhymnia (pol-i-him'ni-a), or Polym'nia, among the Greeks, the muse of the sublime hymn, and according to some of the poets, inventress of the lyre, and of mimes. She is usually represented in art as covered with a white mantle, in a meditative attitude, and without any attribute.

Polymerism (pol-im'er-izm) is a particular instance of isomerism (which see). *Polymerization* is a name given to the process by which a chemical compound is transformed into another having the same chemical elements combined in the same proportions but with different molecular weights: thus the hydrocarbon amylene, C_5H_{10}, when acted on by strong sulphuric acid, is converted into the polymer paramylene, $C_{10}H_{20}$.

Polymorphism (pol-i-mor'fizm), the property possessed by certain bodies of crystallizing in two or more forms not derivable one from the other. Thus, mercuric iodide separates from a solution in tables belonging to the dimetric system; if these crystals are heated they sublime and condense in forms belonging to the monoclinic system; carbonate of calcium exists as calcspar, which crystallizes in rhombohedral forms, and as aragonite, which crystallizes in trimetric forms.

Polynemus. See *Mango-fish.*

Polynesia (pol-i-nē′si-a; Greek, *polys*, many, *nēsos*, island), a general name for a number of distinct archipelagoes of small islands scattered over the Pacific Ocean, extending from about lat. 35° N. to 35° S., and from long. 135° E. to 100° W., the Philippines, New Guinea, Australia, and New Zealand being excluded. (See *Oceania.*) The islands are distributed into numerous groups, having a general direction from N. W. to S. E. The groups north of the equator are the Pelew, Ladrone or Marianne, Caroline, Marshall, Gilbert or Kingsmill, Fanning and Hawaii or the Sandwich Islands. South of the equator are New Ireland, New Britain, Solomon Islands, New Hebrides, Fiji, New Caledonia, Navigator, Friendly, Cook's or Harvey and the Society Islands, the Low Archipelago, the Marquesas Islands, and the isolated Easter Island. The term Polynesia is sometimes restricted to the groups most centrally situated in the Pacific; the New Hebrides, Solomon Islands, New Britain, New Ireland (Bismarck Archipelago), etc., being classed together as Melanesia, whereas the Carolines, Ladrones, Marshall Islands, etc., form Micronesia. The islands may be divided into two chief classes, volcanic and coral islands. Some of the former rise to a great height, the highest peak in the Pacific, Mauna Kea, in Hawaii, reaching 13,895 feet. The principal groups of these are the Friendly, the Sandwich, the Marquesas, and the Navigator Islands. The coral islands comprise the Carolines, Gilbert, and Marshall Islands on the northwest, and the Society Islands and Low Archipelago in the southeast, in both of which groups the *atoll* formation is very common, besides numerous other groups where coral reefs occur. The elevations of these groups do not exceed 500 feet. Polynesia has a comparatively moderate temperature, and the climate is delightful and salubrious. The predominating race, occupying the central and eastern portion of Polynesia, is of Malay origin, with oval faces, wide nostrils, and large ears. The hair and complexion vary greatly, but the latter is often a light brown. Their language is split up into numerous dialects. The other leading race is of negroid or Papuan origin, with negro-like features and crisp, mop-like hair. They are confined to Western Polynesia, and speak a different language, with numerous distinct dialects. Christianity has been introduced into a great many of the islands, and a large number of them are under the control of one or other of the European powers. Many atrocities have been practiced on the natives in recent times in connection with the luring or kidnaping of them to work in the European settlements. The commercial products consist chiefly of cocoanuts, cotton, coffee, sugar, fruits, pearls and trepang. The Ladrones were discovered by Magellan in 1521, the Marquesas by Mendaña in 1595, but it was not until 1767 that Wallis, and subsequently Cook, explored and described the chief islands. Since the natives came in contact with the whites their numbers have greatly decreased. For further information see articles on the individual groups and islands.

Polyni′ces. See *Etcocles.*

Polyp (pol′ip), a term which has been very variously and indiscriminately applied to different animals. It has thus been used to designate any animal of low organization, such as the sea-anemones, corals, and their allies; or it has been employed to indicate animals which, like the cœlenterate zoophytes or Hydrozoa, and the molluscoid Polyzoa, bear a close resemblance to plants. It is now generally applied to any single member of the class Actinozoa, represented by the sea-anemones, corals, and the like; or any member (or zoöid) of a compound organism belonging to that class. The term *polypide* is employed to designate each member or zoöid of the compound forms included in the Polyzoa. The name *polypidon* applies to the entire outer framework or skin-system of a compound form such as a hydrozoan zoophyte. The word *polypite* refers to each separate zoöid or member of a compound zoophyte or hydrozoön. The *polypary* of a hydrozoön specially refers to the horny or chitinous skin secreted by the Hydrozoa.

Polyphemus (pol-i-fē′mus), in Greek mythology, the most famous of the Cyclops, who is described as a cannibal giant with one eye in his forehead, living alone in a cave of Mount Ætna and feeding his flocks on that mountain. Ulysses and his companions having been driven upon the shore by a storm, unwarily took refuge in his cave. Polyphemus, when he returned home at night, shut up the mouth of the cavern with a large stone, and by the next morning had eaten four of the strangers, after which he drove out his flocks to pasture, and shut in the unhappy captives. Ulysses then contrived a plan for their escape. He intoxicated the monster with wine, and as soon as he fell asleep bored out his one eye with the blazing end of a

stake. He then tied himself and his companions under the bellies of the sheep, in which manner they passed safely out in the morning. Polyphemus was the despised lover of the nymph Galatea.

Polyphonic (pol-i-fon'ik), a term applied to a musical composition in two or more parts, each of which forms an independent theme, progressing simultaneously according to the laws of counterpoint, as in a fugue, which is the best example of compositions of the polyphonic class.

Polypodiaceæ (pol-i-pō-di-ā'se-ē), a natural order of ferns, which may be taken as the type of the whole. They constitute the highest order of acrogenous or cryptogamic vegetation, and are regarded as approaching more nearly to cycadaceous gymnosperms than to any other group of the vegetable kingdom. They are usually herbaceous plants with a permanent stem, which either remains buried or rooted beneath the soil, or creeps over the stems of trees, or forms a scarcely movable point of growth, round which new leaves are annually produced in a circle, or it rises into the air in the form of a simple stem, bearing a tuft of leaves at its apex and sometimes attaining the height of 40 feet, as in the tree-ferns.

Polypodium (pol-i-pō'di-um), a genus of ferns, the largest of all, comprising over 450 species, including plants of different modes of growth, and from almost all climates. They bear spore-cases on the back of the frond, distinct, ring-shaped, in roundish *sori*, destitute of *indusium*. *P. calaguala*, a native of Peru, possesses important medicinal properties, solvent, deobstruent, sudorific, etc.

Polyporus (po-lip'or-us), a genus of parasitical fungi. The *P. destructor* is one of the pests of wooden constructions, producing what is sometimes termed *dry rot*, although the true dry rot is a different plant (*Merulius lacrymans*). *P. igniarius* is known by the name of amadou, touchwood, or spunk.

Polypterus (po-lip'ter-us), a genus of fishes inhabiting the Nile, Senegal, and other rivers of Africa, and included in the Ganoid order of the class. They form types of a special family, the Polypteridæ. Their most singular characteristic is the structure of the dorsal fin, which instead of being continuous is separated into twelve or sixteen strong spines distributed along the back, each bordered behind by a small soft fin. In the young there is an external gill. The *Polypterus bichir* attains to a length of 4 feet.

Polypus (pol'i-pus), in medicine, a name given to tumors chiefly found in the mucous membranes of the nostrils, throat, ear, and uterus; rarely in the stomach, bladder, and intestines. Polypi differ much in size, number, mode of adhesion, and nature. One species is the *mucous*, *soft*, or *vesicular*, because its substance consists of mucous membrane with its embedded glands; another is called the *hard* polypus, and consists of fibrous tissue. Polypi may be malignant in character, that is, of the cancerous type. The form *polyp* is also used.

Polysyndeton (pol-i-sin'de-ton), is the name given to a figure of speech by which the conjunctive particles of sentences are accumulated, contrary to usual custom, for the purpose of giving greater emphasis to the terms connected by them, as when Schiller says, 'And it waves, and boils, and roars, and hisses.'

Polysynthetic Languages. See *Philology*.

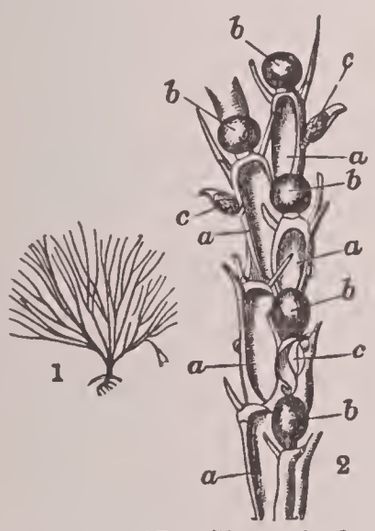
Polytechnic School. See *Ecole Polytechnique*.

Polythalamia (pol-i-thal-ā'mi-a), a group of Protozoa occupying compound chambered cells of microscopical size. In some instances each cell of the common shell presents only one external opening, but more commonly it is punctured with numerous minute pores or foramina, through which the animal can protrude filaments. Their remains constitute the bulk of the chalk and tertiary limestone. See *Foraminifera*.

Polytheism (pol-i-thē'izm; Greek, *polys*, many; *theos*, god), the belief in and worship of a plurality of gods; opposed to monotheism, the belief in and worship of one god. It is still a matter of debate whether polytheism is a primary form of human belief or the degeneration of an original monotheistic idea. It is argued, on the one hand, that the sense of personal dependence, the feeling that there was an undefined power, a mysterious *something* around and above him, did not primarily present itself to the mind of man except under a form of unity. His earliest religion would therefore be of a monotheistic character, but of a highly unstable nature, and eminently liable, among races of rude faculties and little power of abstraction, to assume a polytheistic form, the idea of one Supreme Being being readily obscured by the multiplicity of the visible operations of that being on earth. Those who affirm that polytheism

was a primary form of religious belief argue that man, ignorant of the nature of his own life, and of the nature, origin, and properties of other objects, could at first only attribute vaguely to all visible things the same kind of conscious existence as that which belonged to himself. Thus the sun, moon, and stars would all be living beings; and their influence, from the absence of any idea of a natural order, would be seen in the working of the material world and in all the accidents of human life. As being beyond human control, and as affecting the condition of men, they would be loved or feared; and with the growth of the idea that they might be propitiated or appeased the system of polytheism would be complete. See *Monotheism* and *Mythology.*

Polyzoa (pol-i-zō′a; Gr. *polys*, many; *zōon*, animal), a class of Molluscoida or Lower Mollusca, generally known by the popular names of 'sea-mosses' and 'sea-mats.' They are invariably compound, forming associated growths or colonies of animals produced by gemmation from a single primordial individual, and inhabit a *polyzoarium*, or aggregate of cells, corresponding to the polypidom of the composite hydroids.



A Polyzoon (*Bugŭla avicularia*).

1, Natural size. 2, Portion of same magnified. *a*, Cells. *b*, Ovicells. *c*, Avicularia.

The polypide, or individual polyzoön, resides in a separate cell or chamber, has a distinct alimentary canal suspended freely in a body cavity, and the reproductive organs contained within the body. The body is enclosed in a double-walled sac, the outer layer (*cetocyst*) of which is chitinous or calcareous, and the inner (*endocyst*) a delicate, membranous layer. On the ectocyst are seen certain peculiar processes called 'bird's-head processes,' or *avicularia*, from their shape, the use of which is unknown. The mouth-opening at the upper part of each cell is surrounded by a circlet of hollow, ciliated tentacles, which perform the function of respiration, and are supported on the *lophophore;* and the cell may be closed by a sort of valve called the *epistome.* All the Polyzoa are hermaphrodite. In many cases there are *ovicells* or sacs into which the fertilized ova pass. From these proceed free-swimming ciliated embryos which develop into polypides. Continuous gemmation exists in all. The Polyzoa are classed into three groups: Ectoprocta, Entoprocta, and Aspidophora. The Ectoprocta are divided into two orders of *Phylactolæmata*, with a crescentic lophophore and an epistome; and *Gymnolæmata*, or Infundibulata, with a circular lophophore and no epistome. They are all aquatic in their habits, the marine Polyzoa being common to all seas, but the fresh-water genera are mostly confined to the north temperate zone.

Pomaceæ (po-mā′se-ē), or Po′meæ, a division of the natural order Rosaceæ, to which the apple, pear, quince, and medlar belong. It differs from Rosaceæ proper in having an inferior ovary. The fruit is always a *pome*, with a crustaceous core or bony stones.

Pombal (pom-bål′), Sebastião José Carvalho, Marquis of, a Portuguese statesman, born in 1699; died in 1782. After studying law at Coimbra, Pombal served for some time in the army. In 1739 he was appointed ambassador in London. He was recalled in 1745, and the queen sent him to Vienna to act as mediator between the pope and Maria Theresa. Under Joseph I he became secretary of state for foreign affairs. He soon rendered the king entirely subject to his influence, and proceeded to the accomplishment of his favorite objects — the expulsion of the Jesuits, the humiliation of the greater nobles, the restoration of Portugal's prosperity, and the absolute command of the state in the name of the monarch. He deprived the leading nobles of their princely possessions in the colonies, and abridged the powers of the prelacy. In 1757 he deprived the Jesuits of the place of confessors and ordered them to retire to their colleges. A conspiracy against the life of the king afforded him opportunity to banish the whole order of Jesuits from the kingdom in 1759. Pombal reorganized the army, and was active in his efforts to improve the country in every relation; he paid particular attention to education. Joseph I

died in 1777, and was succeeded by his daughter, Maria I, who immediately deprived Pombal of his offices.

Pomegranate (pom'gra-nat; *Punica granātum*, order Myrtaceæ), a dense, spiny shrub, from 8 to 20 feet high, supposed to have belonged originally to the north of Africa, and subsequently introduced into Italy. It was called by the Romans *malum Punicum*, or Carthaginian apple. The leaves are opposite, lanceolate, entire, and

Pomegranate (*Punica granātum*).

smooth; the flowers are large and of a brilliant red; the fruit is as large as an orange, having a hard rind filled with a soft pulp and numerous red seeds. The pulp is more or less acid and slightly astringent. The pomegranate is extensively cultivated throughout Southern Europe, and sometimes attains a great size. Another species (*P. nana*) inhabits the West Indies and Guiana.

Pomerania (pom-ē-rā'ni-a; German, *Pommern*), a province of Prussia, bounded by the Baltic Sea, Mecklenburg, Brandenburg, and West Prussia; area, 11,622 square miles. The coast is low and sandy and lined by numerous lagoons. The chief islands along the coast are Rügen, Usedom, and Wollin. The interior is flat and, in parts, marshy. The principal rivers are the Oder, Persante, and Stolpe. The soil is generally sandy and indifferent, but there are some rich alluvial tracts, producing a quantity of grain. Flax, hemp, and tobacco are also cultivated. Domestic animals are numerous. The forests are of large extent. Fish are abundant. There are few minerals. Manufactures include woolen and other fabrics. A considerable general and transit trade is carried on. The center of trade is Stettin, which ranks as one of the chief commercial cities of Prussia. Pomerania appears to have been originally inhabited by Goths, Vandals, and Slavs. The first mention of it in history is in 1140. It long remained an independent duchy, and in 1637, on the extinction of the ducal family, it was annexed to Sweden. On the death of Charles XII it was ceded to the electoral house of Brandenburg, with the exception of a part which subsequently was also obtained by Prussia. For administrative purposes it is divided into three governments, Stettin, Köslin, and Stralsund. Pop. 1,716,921.

Pomfret (pom'fret), JOHN, an English poet, born in 1667; died in 1702. He was rector of Maulden in Bedfordshire, and published a volume of *Poems* in 1699, one of which *The Choice*, was long very popular.

Pomona (po-mō'na), among the Romans, the goddess of fruit, and wife of Vertumnus.

Pomona, a city of Los Angeles Co., California, 33 miles E. of Los Angeles, in the San Gabriel valley. Largest orange and lemon shipping district in the world; also a health resort. Pop. (1910) 10,207; (1920) 13,505.

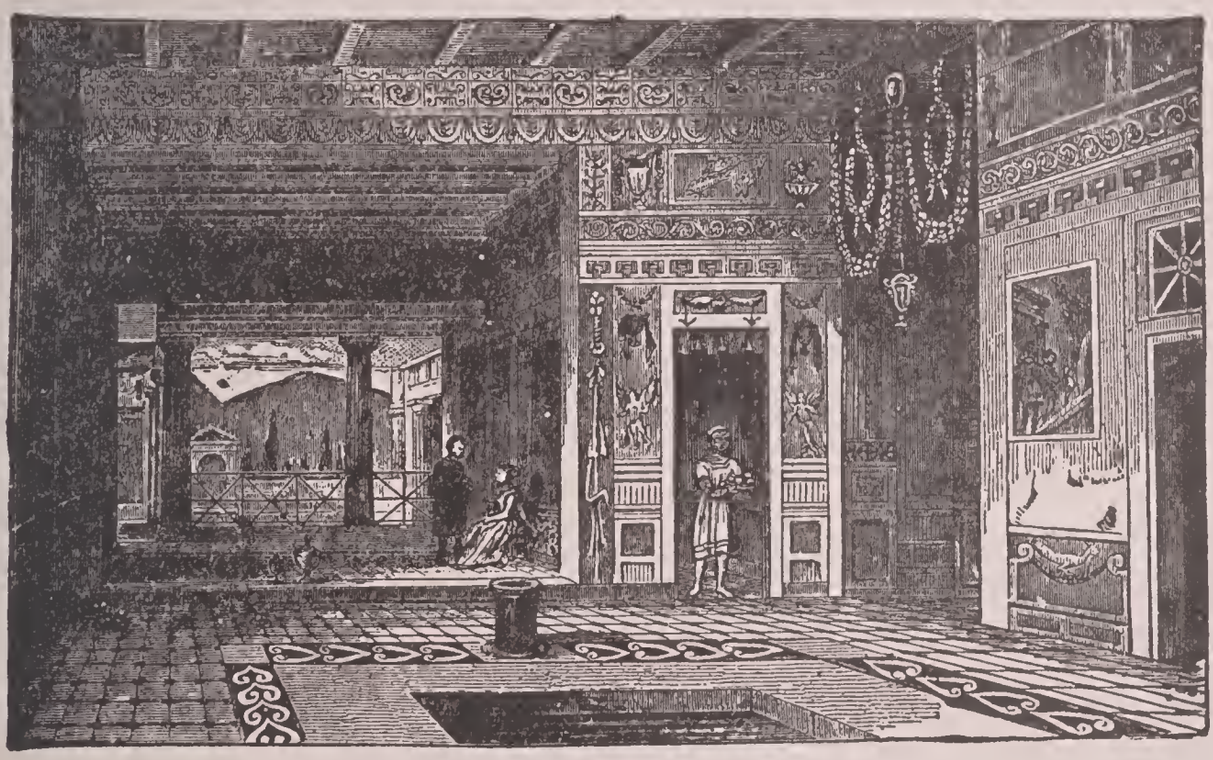
Pomona, or MAINLAND, the largest and most populous of the Orkney Islands; length from northwest to southeast, 23 miles; extreme breadth about 15 miles; area 150 square miles; pop. 17,165. It is extremely irregular in shape, and on all sides except the west is deeply indented by bays and creeks. The surface is covered in great part by moor and heath, but good pasture is also to be found, and in the valleys a good loamy soil occurs. The principal towns are Kirkwall and Stromness. See *Orkney*.

Pompadour (poṇ-pȧ-dör), JEANNE ANTOINETTE POISSON, MARQUISE DE, the mistress of Louis XV, was born in 1721, and was said to be the daughter of the farmer-general Lenormand de Tournehem, who at his death left her an immense fortune. In 1741 she married her cousin, Lenormand d'Etiolles. A few years later she succeeded in attracting the attention of the king, and soon entirely engrossed his favor. In 1745 she appeared at court as the Marquise de Pompadour. Here she at first posed as the patroness of learning and the arts, but with the decay of her charms she devoted her attention to state affairs. Her favorites filled the most important offices, and she is said

VISTA THROUGH THE ARCH OF CALIGULA, AT POMPEII

to have brought about the war with Frederick II. She died in 1764, at the age of forty-four, hated and reviled by the nation.

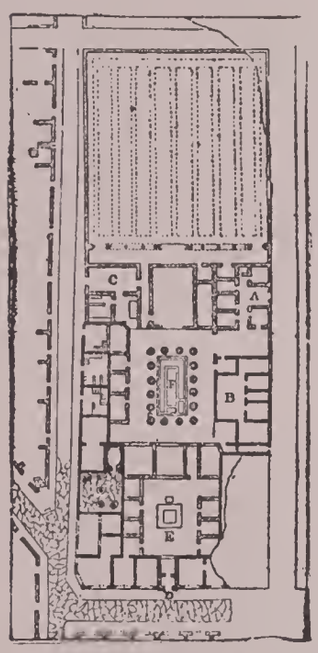
Pompeii (pom-pē'yi), an ancient city of Italy, in Campania, near the Bay of Naples, about 12 miles southeast from the city of that name, and at the base of Mount Vesuvius on its southern side. Before the close of the republic, and under the early emperors, Pompeii became a favorite retreat of wealthy Romans. In A.D. 63 a fearful earthquake occurred, which destroyed a great part of the town. The work of rebuilding was soon commenced, and the new town had a population of some 30,000 when it was overtaken by another catastrophe on August 24, A.D. 79. This consisted in an eruption of Mount Vesuvius, which suddenly belched forth tremendous showers of ashes, red-hot pumice-stone, etc. These overwhelmed the city and buried it to a considerable depth. The present superincumbent mass is about 20 feet in thickness. A portion of this was formed by subsequent eruptions, but the town had been buried by the first catastrophe and entirely lost to view. Pompeii was lost in oblivion during the middle ages, and it was not until 1748, when a peasant in sinking a well discovered a painted chamber with statues and other objects of antiquity, that anything like a real interest in the locality was excited. Excavations were now prosecuted, and in 1755 the amphitheater, theater, and other parts were cleared out. Under the Bourbons the excavations were carried out on a very unsatisfactory plan. Statues and articles of value alone were extricated, while the buildings were suffered to fall into decay or were covered up again. To the short reign of Murat (1808-15) we are indebted for the excavation of the Forum, the town walls, the Street of Tombs, and many private houses. Recently the government of Victor Emmanuel assigned $12,500 annually for the prosecution of the excavations, and a regular plan has been adopted, according to which the ruins are systematically explored and carefully preserved. The town is built



Pompeii — House of the Tragic Poet, so-called.

in the form of an irregular oval extending from east to west. The circumference of the walls measures 2925 yards. The area within the walls is estimated at 160 acres; greatest length, ¾ mile; greatest breadth, ½ mile. There are eight gates. The streets are straight and narrow and paved with large polygonal blocks of lava. The houses are slightly constructed of concrete, or occasionally of bricks. Numerous staircases prove that the houses were of two or three stories. The ground floor of the larger houses was generally occupied by shops. Most of the larger houses are entered from the street by a narrow passage (*vestibulum*) leading to an internal hall (*atrium*), which provided the surround-

ing chambers with light and was the medium of communication; beyond the latter is another large public apartment termed the *tabulinum*. The other portion of the house comprised the private rooms of the family. All the apartments are small. The shops were small and all of one character, having the business part in front and one or two small chambers behind, with a single large opening serving for both door and window. The chief public buildings are the so-called Temple of Jupiter, the Temple of Venus, the Basilica, the Temple of Mercury, the Curia, and the Pantheon or Temple of Augustus. There are several interesting private buildings scattered through the town, including the villa of Diomedes, the house of Sallust, and the house of Marcus Lucretius. The Museum of Naples owes many of its most interesting features to the ornaments, etc., found in the public and private edifices above mentioned. The site of the city has been largely cleared. Much care is now taken for the preservation of the buildings and their contents, which are kept in place where found.



House of Pansa, Pompeii.

Pompey (pom'pi), in full CNEIUS POMPEIUS MAGNUS, a distinguished Roman, born B.C. 106, was the son of Cneius Pompeius Strabo, an able general. In B.C. 89 he served with distinction under his father in the war against the Italian allies. In the struggle between Marius and Sulla, Pompey raised three legions to aid the latter, and regained all the territories of Africa which had forsaken the interest of Sulla. This success excited the jealousy of Sulla, who recalled him to Rome. On his return Sulla greeted him with the surname of Magnus (Great). Pompey demanded a triumph, to which Sulla reluctantly consented. He entered Rome in triumph in September, 81, and was the first Roman permitted to do so without possessing a higher dignity than that of equestrian rank. After the death of Sulla, Pompey put an end to the war which the revolt of Sertorius in Spain had occasioned, and in 71 obtained a second triumph. In this year, although not of legal age and having no official experience, he was elected consul with Crassus. In 67 he cleared the Mediterranean of pirates, and destroyed their strongholds on the coast of Cilicia. In four years, 65-62, he conquered Mithridates, Tigranes, and Antiochus, king of Syria. At the same time he subdued the Jews and took Jerusalem by storm. He returned to Italy in 62 and disbanded his army, but did not enter Rome until the following year, when he was honored with a third triumph. He now, in order to strengthen his position, united his interest with those of Cæsar and Crassus, and thus formed the first triumvirate. This agreement was concluded by the marriage of Pompey with Cæsar's daughter Julia; but the powerful confederacy was soon broken. During Cæsar's absence in Gaul Pompey ingratiated himself with the senate, was appointed sole consul, and the most important state offices were filled with Cæsar's enemies. Through his influence Cæsar was proclaimed an enemy to the state, and his rival was appointed general of the army of the republic. Cæsar, alarmed by this, marched to Italy, crossed the Rubicon in 49 (see *Cæsar*), and in sixty days was master of Italy without striking a blow. Pompey crossed over to Greece, and in this country, on the plains of Pharsalia, occurred the decisive battle the result of which made Cæsar master of the Roman world. Pompey fled to Egypt, where he hoped to find a safe asylum. The ministers of Ptolemy betrayed him, and he was stabbed on landing by one of his former centurions in B.C. 48.

Pompey.— Antique Gem.

Pompey's Pillar, a monolith of red granite, erected at Alexandria, Egypt, by the Roman prefect Pompeius in honor of Diocletian, about 302 A. D.

Ponca City (pon'ka), a city of Kay Co., Oklahoma, on Arkansas River. It is the center of oil and gas production; also great Indian trading point. Has refineries, lubricant plants, etc. Pop. (1920) 7051.

Ponce (pon'sā), capital of Ponce Department, Porto Rico. An important port with large shipments of sugar, coffee, tobacco, and other products. Second largest city of the island. Pop. (1920) 41,561.

Ponce de Leon (pon'the de le-on'), JUAN, one of the early Spanish discoverers in America, born about 1460; died in Cuba in 1521. He accompanied Columbus on his second expedition in 1493, and was sent by Ovando to conquer the island of Porto Rico. Having there amassed great wealth, and received information of an island situated to the north, which he was made to believe contained the 'Fountain of Youth,' a fabled fount capable of conferring perpetual youth, he organized an expedition and discovered the country, to which he gave the name of Florida, though he failed to find the fountain. Ponce returned to Spain in 1513, and was appointed by Ferdinand governor of the island of Florida, as he called it, on condition that he should colonize it. In 1521 he embarked nearly all his wealth in two ships, and proceeded to take possession of his province. He was, however, met with determined hostility by the natives, who made a sudden attack upon the Spaniards, and drove them to their ships. In the combat Ponce de Leon received a wound from which he soon afterwards died.

Ponce de Leon, LUIS, a Spanish lyric poet, born in 1527, probably at Granada; died in 1591. He entered the order of St. Augustine at the age of sixteen, and became professor of sacred literature at Salamanca. He translated the *Song of Solomon* into Castilian, for which he was brought before the Inquisition at Valladolid (1572) and thrown into prison. At the end of five years he was liberated and reinstated in all his offices, and was elected head of his order. His original productions are chiefly of a religious character.

Poncho (pon'chō), a kind of cloak much worn by the South American Indians, and also by many of the Spanish inhabitants. It is a piece of thick woolen cloth of rectangular form, from 5 to 7 feet long and 3 to 4 feet broad, with a hole in the center for the head to pass through.

Pondicherry (pon-di-sher'i; French, *Pondichéry*), a town, capital of the French East Indian settlement of the same name, on the east or Coromandel coast, 85 miles south by west from Madras. Its territory is surrounded on the land side by the British district of South Arcot, and has an area of 115 square miles; pop. about 200,000. The town, with a pop. of 47,972, stands on a sandy beach, and consists of two divisions separated by a canal. The 'White Town,' or European quarter, on the east, facing the sea, is very regularly laid out, with well-built houses. The 'Black Town,' or native quarter, on the west, consists of houses or huts of brick or earth, and a few pagodas. There is an iron pier, and railway communication with the South Indian system was opened in 1879. The settlement was purchased by the French from the Bejapoor rajah in 1672 and has been repeatedly in the hands of the British.

Pondoland (pon'dō-land), a maritime territory of S. Africa, between Cape Colony and Natal, measuring about 90 miles from N. E. to S. W., and about 50 from N. W. to S. E. Pop. about 200,000. It was the last remnant of independent Kaffraria, and became a British protectorate in 1884.

Pondweed. See *Potamogeton.*

Poniatowski (pō-nē-a-tov'skē), an illustrious Polish family. STANISLAUS, Count Poniatowski, born in 1678; died in 1762, is known for his connection with Charles XII, whom he followed into Turkey. He wrote *Remarques d'un Seigneur Polonais sur l'Histoire de Charles XII, par Voltaire* (Hague, 1741).—His eldest son, S. STANISLAUS AUGUSTUS, born 1732, the favorite of Catharine II, was elected King of Poland in 1764.—JOZEF, the nephew of King Stanislaus, born in 1762, served against the Russians in 1792, and in 1794 joined the Poles in their attempt to drive the Russians out of the country, and commanded a division at the sieges of Warsaw. In 1809 he commanded the Polish army against the superior Austrian force which was sent to occupy the Duchy of Warsaw, and compelled it to retire. In 1812 he led the Polish forces against Russia. During the battle of Leipzig Napoleon created him a marshal.

Ponsard (poṇ-sär), FRANÇOIS, a French dramatist, born at Vienne, in Dauphiné, in 1814; died in 1867. His first success was his *Lucrèce*, produced in 1843, and welcomed as a return to classicism. Among his other pieces are *Agnès de Méranie*, *Charlotte Corday*, *L'Honneur et l'Argent*, etc. He became a member of the Academy in 1855.

Ponta-Delgada (pōṇ'ta-dāl-gä'da), or PONTE-DELGADA.

a seaport on the south side of the island of St. Michael, one of the Azores. It is built with considerable regularity, and the houses are substantial. A recently constructed breakwater has much improved the anchorage, and it has now an excellent harbor. The chief exports are wheat, maize, and oranges. Pop. 17,675.

Pont-à-Mousson (pon-tà-mö-sön), a town of France, dep. of Meurthe-et-Moselle, 16 miles northwest of Nancy, on both sides of the Moselle, here crossed by a bridge. It has a handsome Gothic church dedicated to St. Martin; the old abbey of St. Mary, now converted into a seminary; a college, etc. Pop. 14,009.

Pontchartrain (pont-chär'trān), a lake of Louisiana, reaching within 5 miles of New Orleans, about 40 miles long from east to west, and nearly 25 in breadth. It is from 12 to 14 feet deep, and communicates with Lake Borgne on the east, with Lake Maurepas on the west, and by means of a canal with New Orleans on the south.

Ponte-Corvo (pon'tā-kor'vō), a town of S. Italy, province of Caserta, 20 miles southeast of Frosinone, in an isolated territory on the left bank of the Garigliano. It is the see of a bishop, has manufactures of macaroni and plastic ware, and the whole district is rich in Roman remains. It was the capital of a principality created by Napoleon I, and from which Bernadotte had his title of Prince de Ponte-Corvo. Pop. 10,518.

Pontedera (pon-tā-dā'ra), a town of Italy, province Pisa, on the Era, not far from its mouth, on the Arno; manufactures cotton goods. Pop. 7499.

Pontefract (pom'fret, or pon'te-frakt), a municipal and parliamentary borough of England, in the county and 24 miles S. S. W. of York, near the confluence of the Aire and Calder. Pop. (1911), 15,960.

Pontevedra (pon-te-vā'*dra*), a town in Northwest Spain, capital of a province of the same name. Pop. 22,806.—The province produces in abundance maize, rye, wheat and millet, flax, fruit and wine, and rears great numbers of cattle. Area, 1730 square miles; pop. 457,262.

Pontiac (pon'ti-ac), chief of the Ottawa Indians (1720-69), born on the Ottawa River. On the alliance of the Chippeways, Pottawattomies and the Ottawas, he became chief of the three tribes. He attempted to drive out the English and recover the country for the Indians. For several months he besieged Detroit and captured many forts. In 1766, at Oswego (q. v.), he entered into a treaty of peace with Sir William Johnson (q. v.). He was murdered in 1769 by a Kaskasia Indian who was bribed with liquor and money. Consult Parkman's 'History of the Conspiracy of Pontiac and the War of the North American Tribes against the English Colonies.'

Pontiac, a city, county seat of Oakland county, Michigan, 26 miles N. N. W. of Detroit in the center of a beautiful lake region. The plants of the General Motors Corporation are located in Pontiac. Over 7000 people are employed here in the manufacture of automobiles and parts. Other products are farm implements, paints, varnishes, foundry products, etc. It is on the Grand Trunk and other railroads. The city was named in honor of the Indian chief Pontiac. Pop. (1910) 14,532; (1920) 34,273.

Pontiac, county seat of Livingston Co., Illinois, on Vermilion River, 93 miles S. S. W. of Chicago, in the heart of the corn belt. It has shoe factories, foundry, etc. The State Reformatory is here. Pop. 6664.

Pontianak (pon-tē-ä-näk'), the capital of the Dutch settlements on the W. coast of Borneo, at the confluence of the Landak and Kapuas, almost on the equator. It has some trade in gold dust, diamonds, sugar, rice, coffee, cotton, and edible birds'-nests. Pop. 18,000.

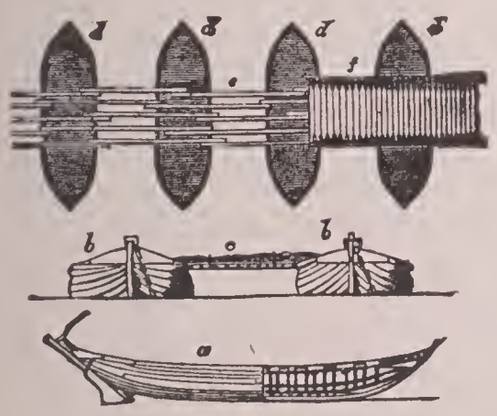
Pontifex (pon'ti-feks); among the ancient Romans a priest who served no particular divinity. The Roman pontifices formed the most illustrious among the great colleges of priests. Their institution was ascribed to Numa, and their number varied at different periods from four to sixteen. The *pontifex maximus*, or chief pontiff, held his office for life, and could not leave Italy. The emperor afterwards assumed this title until the time of Theodosius, and it subsequently became equivalent to pope.

Pontine Marshes, an extensive marshy tract of land in Italy, in the S. part of the Roman Campagna, extending along the shores of the Mediterranean for about 24 miles, with a mean breadth of 7 miles. The Romans, by the construction of the Appian way and by means of canals, laid a considerable part of them dry, and many of the popes engaged in the drainage and reclaiming of the marshes. In 1899 the Italian government set aside $1,400,000 for the purpose of draining these marshes —a work estimated to occupy 24 years. The vast tract is inhabited by a scanty

population of husbandmen and shepherds, who, if possible, spend only a part of the year here.

Pontoise (pon-twäz), a town in France, department of Seine-et-Oise, at the confluence of the Viosne with the Oise. It has manufactures of chemical products, hosiery, etc. Pop. 9023.

Pontoon (pon'tön'), in military engineering, a flat-bottomed boat, or any light framework or floating body used in the construction of a temporary bridge over a river. One form of pontoon is a hollow tin-plate cylinder, with hemispherical ends, and divided by several longitudinal and transverse partitions to act as braces and to prevent sinking if pierced by a shot or by accident. Another is in the form of a decked canoe, and consists of a timber



Pontoon and Pontoon Bridge.

a, Pontoon, external and internal structure. *b b*, End of same, supporting the roadway. *c*, Plan of bridge. *d d*, Pontoons. *e*, Rafters for supporting the roadway. *f*, Roadway complete.

frame covered with sheet copper. It is formed in two distinct parts, which are locked together for use and dislocated for transportation, and is also divided into air-tight chambers. The name is also given to a water-tight structure or frame placed beneath a submerged vessel and then filled with air to assist in refloating the vessel; and to a water-tight structure which is sunk by filling with water and raised by pumping it out, used to close a sluice-way or entrance to a dock.

Pontoppidan (pon-top'pē-dan), Erik, a Danish writer, born in 1698; died in 1764. He became preacher to the court in 1735, and soon after professor of theology in Copenhagen. In 1747 he was made bishop of Bergen, and 1755 chancellor of Copenhagen University. Pontoppidan wrote several works of historical and scientific interest, including *Natural History of Norway*, *Annals of the Danish Church*, etc.

Pontus (pon'tus), a kingdom in Asia Minor (so-called from the Pontus Euxinus, on which it lay), which extended from Halys on the west to Colchis on the east, and was bounded on the north by the Euxine Sea, and on the south by Galatia, Cappadocia and Armenia Minor. The first king was Artabazes, son of Darius. The kingdom was in its most flourishing state under Mithridates the Great. But soon after his death (B.C. 63) it was conquered by Cæsar, and made tributary to the Roman Empire. In 1204 Alexius Comnenus founded a new kingdom in Pontus, and in 1461 Mohammed II united it with his great conquests.

Pontus Euxi'nus, the ancient name for the Black Sea (which see).

Pontypool (pon'ti-pöl), a town and important railway center of England, in the county and 15½ miles southwest of Monmouth. The greater portion of the population is employed in ironworks and forges and works for making tin-plate. Pop. 6126.

Pontyprydd (pont-ē-prith'), a town of South Wales, in Glamorganshire, at the confluence of the Rhondda with the Taff. It has rapidly increased in recent times owing to the adjacent coal and iron mines. Pop. (1911), 43,215.

Pony (pō'ni), a term applied to the young of the horse and also to several subvarieties or races of horses, generally of smaller size than the ordinary horses, and which are bred in large flocks and herds in various parts of the world, chiefly for purposes of riding and of lighter draught work. Among well-known breeds are the Welsh, Shetland, Iceland, Canadian, etc.

Poodle (pö'dl), a small variety of dog covered with long, curling hair, and remarkable for its great intelligence and affection. The usual color is white, but black and blue, if good in other points, are highly valued.

Poole (pöl), a seaport of England, county of Dorset, on the north part of Poole Harbor, an ancient place. The old town is being surrounded by handsome suburbs at a rapid rate, and there are many fine public buildings. The manufactures consist chiefly of cordage and sail-cloth; there are also potteries, large flour-mills, and two iron foundries. The harbor is large and commodious, with excellent quays and extensive warehouses. The chief exports are clay for the Staffordshire potteries,

and manufactured clay goods. Pop. 38,886.

Poole, MATTHEW, the compiler of the *Synopsis Criticorum Biblicorum*, was born at York about 1624; died at Amsterdam in 1679. He studied at Emmanuel College, Cambridge, and took orders. In 1662 he was ejected by the Act of Uniformity from his church of St. Michael-le-Querne in London, and subsequently retired to Holland. He devoted ten years to his *Synopsis*, which is an attempt to condense into one work all biblical criticisms written previous to his own times.

Poole, WILLIAM FREDERICK, bibliographer, was born at Salem, Massachusetts, in 1821; died in 1894. He was a librarian in Cincinnati, Boston, and Chicago. His chief work is his very useful *Index to Periodical Literature.*

Poonac (pö'nuk), the substance left after cocoanut oil is expressed from the nuts, used as manure and for feeding stock.

Poonah (pö'na), or PUNA, a city and district of British India, presidency of Bombay. It is about 119 miles east of Bombay by the Great Indian Peninsular Railway. The city is well built, and has the Deccan college for classics, mathematics, and philosophy, and a college of science with special training in civil engineering, also training college, female normal school, and other schools, public library, hospital, arsenal, barracks, etc. It was the capital of the Peishwa, or head of the Mahratta confederacy. It is a health resort, and for part of the year the seat of the Bombay government. Manufactures include gold and silver jewelry, small ornaments in brass, copper, and ivory, and silk and cotton fabrics. It is an important military station (the cantonments lying to the north of the town), and good roads connect it with Bombay, Ahmednagar, Sattarah, etc. Pop. 153,320, of whom 30,129 are in the cantonments.—The district has an area of 5348 sq. miles, and a pop. of 995,330. It is an el(ated tableland, watered by the Bh na and its tributaries, and abounding in isolated heights, formerly crowned with very strong fortresses. The inhabitants chiefly are Mahrattas.

Poon (pön), or POONA WOOD, is the wood of the poon tree (*Calophyllum inophyllum* and *Calophyllum angustifolium*), a native of India. It is of a light, porous texture and is much used in the East Indies in shipbuilding for planks and spars. The Calcutta poon is preferred to that of other districts. Poon seed yields an oil called *dilo*, poon-seed oil, etc.

Poop (pöp), the aftermost and highest part of the hull in large vessels; or, a partial deck in the aftermost part of a ship above the deck proper.

Poor (pör), those who lack the means necessary for their subsistence. At no period in the history of the world, and among no people, can there be said to have existed no poor, and probably in all civilized communities some provision, however inadequate, has been made for their support. In Rome, in its earlier days at least, the contest between the plebeians and patricians partook very much of the nature of a struggle between poverty and riches, and in later times corn or bread was often doled out free to needy citizens. During the middle ages the great majority of the people were maintained in a state of bondage by their feudal superiors, and many freemen, in order to avoid destitution, surrendered their liberty and became serfs. In all the countries of modern Europe laws have been enacted relative to the maintenance of the poor. In England, up to the time of Henry VIII, the poor subsisted entirely on private benevolence. Numerous statutes were passed in the reign of Henry VIII and following reigns to provide for the poor and 'impotent,' but these were far from sufficient and other measures were adopted, overseers of the poor being appointed in 1601 in every parish. Their chief duties were: first, to provide for the poor, old, impotent; and, secondly, to provide work for the able-bodied out of employment. For these purposes they had power to levy rates on the inhabitants of the parish. This Elizabethan act is the basis of the present English poor-law system. The statute of 1601 was modified by a law of Charles II in 1662 and from this period till 1834 the administration of relief was entrusted to the church wardens and inspectors. The working of these laws was attended with numerous abuses, and in 1834 the Poor Law Amendment Act was passed, which with some more recent statutes forms the legislation in actual operation at the present day.

A legal claim to relief exists in most of the northern European countries, but in others no such edict as a poor law exists. Poor laws in the United States are of local enactment. General laws have been passed by some of the states, but town authorities usually adopt regulations for the care of the poor. Several states have passed what are called 'tramp laws,' making it a criminal of-

fense for the class of paupers generally styled 'tramps' to wander through the state without 'visible means of support.' In some states the farming out of the town poor to the lowest bidder is still practiced. The town in which a pauper has legal settlement is required to support him.

Pooree (pö'rē), or PURI, commonly called JUGGERNAUT, a town in the province of Orissa (India). The town is 250 miles S. W. from Calcutta, and 595 miles N. of Madras. It contains the shrine of Juggernaut, to whose worship crowds flock from every part of India. Pop. about 30,000.

Poore (pör), BENJAMIN PERLEY, journalist, was born near Newburyport, Massachusetts, in 1820. His lifework was that of Washington correspondent. His letters to the *Boston Journal* and to other papers gained him a national reputation by their trustworthy character. He was an industrious collector of historical matter, and published several works, some of which had large circulation. In 1867 he began to edit the *Congressional Directory;* brought out the annual abridgment of the public documents for many years; also made a compilation of United States treaties with different countries. He died in 1887.

Popayan (pō-pa-yän'), a city of Colombia, and capital of the state of Cauca, situated near the river Cauca, and 228 miles S. W. of Bogotá. It is the see of a bishop, and has a university, a cathedral, a hospital, and other public buildings. In 1834 it was nearly destroyed by an earthquake. Pop. (1906 estimate) 10,000.

Pope (pōp; Latin *papa*, Greek, *papas*, father), the title given to the head of the Roman Catholic hierarchy. It seems to have been used at first in the early church as a title of reverence given to ecclesiastics generally, and at the present time it is applied in the Greek Church to all priests. In the early Western Church the title of pope was ultimately bestowed upon the metropolitan bishops, but in the struggle for pre-eminence the claim to be recognized as the only pope was enforced by the Bishop of Rome. This claim of preëminence was founded on the belief, supported by the early traditions of the church, that the Apostle Peter planted a church in Rome, and that he died there as a martyr. This tradition, taken in connection with the alleged preëminence of Peter among Christ's disciples, came to be regarded as sufficient reason for the primacy of the Bishop of Rome in the church. Consequently from the very earliest times the Bishop of Rome was the first among the five patriarchs or superior bishops of Christendom. A decree of the emperor Valentian III (445) acknowledged the Bishop of Rome as primate, but until the eighth century many measures of the popes met with violent opposition. Leo the Great (440-461) did not fail to base his claims to the primacy on divine authority by appealing to Matt., xvi, 18; and he did much to establish the theory that bishops in disputes with their metropolitans had a right of appeal to Rome. The Eastern Church early resisted the see of Rome, and this mainly occasioned the schism that in 1054 divided Christendom into the Greek and Latin Churches. Non-Catholics allege that several circumstances contributed to open to the popes the way to supreme control over all churches. Among these they cite the establishment of missionary churches in Germany directly under Rome, the pseudo-Isidorian decretals, which contained many forged documents supporting the general supremacy of the Roman pontiff, the gradations of ecclesiastical rank, and the personal superiority of some popes over their contemporaries. Leo the Great (440-461), Gregory I, the Great (590-604), and Leo III (795-816), who crowned Charlemagne, all increased the authority of the papal title. Much violence and politics marked papal elections in the tenth and eleventh centuries. In 1059 the dignity and independence of the papal chair were heightened by the constitution of Nicolas II, placing the right of election of the pope in the hands of the cardinals. In 1073 Gregory VII, at a Roman council, formally prohibited the use of the title of pope by any other ecclesiastic than the Bishop of Rome; he also enforced a celibate life upon the clergy, and prohibited lay investiture. The reign of Innocent III (1198-1216) raised the papal see to the highest degree of power and dignity; and having gained almost unlimited spiritual dominion, the popes now began to extend their temporal power also. The dominions under the pope's temporal rule had at first consisted of a territory granted to the papal see by Pepin in 754, which was subsequently largely increased. The popes, however, continued to hold to some extent the position of vassals of the German Empire, and until the twelfth century the emperors would not permit the election of a pope to take place without their sanction. Innocent III, however, largely increased his territories at the expense of the empire, and the power

of the emperors over Rome and the pope may now be said to have come to an end. Favorable circumstances had already made several kingdoms tributary to the papal see, which had now acquired such power that Innocent III was enabled both to depose and to proclaim kings, and put both France and England under an interdict. France was the first to resist successfully the papal authority. In Philip the Fair Boniface VIII found a political superior, and his successors from 1307 tc 1377 remained under French influence, and held their courts at Avignon. Their dignity sunk still lower in 1378, when two rival popes appeared, Urban VI and Clement VII, causing a schism and scandal in the church for thirty-nine years. This schism did much to lessen the influence of the popes in Christendom, and it subsequently received a greater blow from the Reformation. During the reign of Leo X (1513-25) Luther, Zuinglius and Calvin were the heralds of an opposition which separated almost half the West from the popes, while the policy of Charles V was at the same time diminishing their power, and from this time neither the new support of the Society of Jesuits nor the policy of the popes could restore the old authority of the papal throne. The national churches obtained their freedom in spite of all opposition, and the Peace of Westphalia (1648), bringing to an end the Thirty Years' war and the religious struggle in Germany, gave public legality to a system of toleration which was in direct contradiction to all earlier conduct. The bulls of the popes were now no longer of avail beyond the states of the church without the consent of the sovereigns, and the revenues from foreign kingdoms decreased. Pius VI (1775-99) witnessed the revolution which not only tore from him the French Church, but even deprived him of his dominions. In 1801, and again in 1809, Pius VII lost his liberty and possessions, and owed his restoration in 1814 to a coalition of temporal princes, among whom were two heretics (English and Prussian) and a schismatic (the Russian). Nevertheless he not only restored the Inquisition, the order of the Jesuits, and other religious orders, but advanced claims and principles entirely opposed to the ideas and resolutions of his liberators. The same spirit that actuated Pius VII actuated in like manner his successors, Leo XII (1823-29), Pius VIII (1829-30), and above all Gregory XVI (1831-46). The opposition of the latter to all changes in the civil relations of the papal dominions contributed greatly to the revolution of 1848, which obliged his successor, Pius IX, to flee from Rome. The temporal power of the papacy was further weakened by the events of 1859, 1860, and 1866. And after the withdrawal of the French troops from Italy in 1870, King Victor Emmanuel took possession of Rome, and since that time the pope has lived in almost complete seclusion in the Vatican.

By the decrees of the Vatican Council of 1870 the pope has supreme power in matters of discipline and faith over all and each of the pastors and of the faithful. It is further taught by the Vatican Council that when the pontiff speaks *ex cathedra*, that is, when he, in virtue of his apostolic office, defines a doctrine of faith and morals to be held by the whole church, he possesses infallibility by divine assistance. The pope cannot annul the constitution of the church as ordained by Christ. He may condemn or prohibit books, alter the rites of the church, and reserve to himself the canonization of saints. A pope has no power to nominate his successor, election being entirely in the hands of the cardinals, who are not bound to choose one of their own body. The papal insignia are the tiara or triple crown, the straight crosier, and the pallium. He is addressed as 'Your holiness.'

We subjoin a table of the popes, according to the Roman Notizie, with the dates of the commencement of their pontificates. The names printed in italics are those of anti-popes: —

St. Peter . . A.D.	42	St. Marcellinus. . . . . A.D.	296
St. Linus	66	(See vacant 3 years and 6 months.) .	
St. Anacletus . .	78	St. Marcellus I.	308
St. Clement I .	91	St. Eusebius . .	310
St. Evaristus . .	100	St. Melchiades or Miltiades . . .	311
St. Alexander I	108	St. Sylvester I	314
St. Sixtus I . . .	119	St. Marcus . . .	336
St. Telesphorus.	127	St. Julius I . .	337
St. Hyginus . . .	139	Liberius	352
St. Pius I	142	St. Felix II (sometimes reckoned an Anti-pope) . .	355
St. Anicetus . . .	157	St. Damasus I .	366
St. Soterus	168	St. Siricius . . .	384
St. Eleutherius.	177	St. Anastasius I	398
St. Victor I . . .	193	St. Innocent I .	402
St. Zephirinus .	202	St. Zosimus . . .	417
St. Callixtus I .	217	St. Boniface I— *Eulalius*	418
St. Urban I . . .	223	St. Celestine I .	422
St. Pontianus . .	230	St. Sixtus III .	432
St. Anterus . . .	235	St. Leo I the Great	440
St. Fabian	236	St. Hilary	461
St. Cornelius . .	250		
St. Lucius I— *Novatianus* . .	252		
St. Stephen I . .	253		
St. Sixtus II . .	257		
St. Dionysius . .	259		
St. Felix I	269		
St. Eutychianus.	275		
St. Caius	283		

St. Simplicius . 468
St. Felix III .. 483
St. Gelasius I . 492
St. Anastasius II 496
St. Symmachus. 498
St. Hormisdas.. 514
St. John I.... 523
St. Felix IV.. 526
Boniface II... 530
John II 532
St. Agapetus I. 535
St. Silverius .. 536
Vigilius 537
Pelagius I 555
John III 560
Benedict I (Bonosus) .. 574
Pelagius II ... 578
St. Gregory I (The Great) 590
Sabinianus 604
Boniface III... 607
St. Boniface IV 608
St. Deusdedit.. 615
Bonifacc V.... 619
Honorius I.... 625
(See vacant 1 year and 7 months.)
Severinus 640
John IV 640
Theodorus I... 642
St. Martin I... 649
St. Eugenius I. 654
St. Vitalianus. 657
Adeotatus 672
Domnus I 676
St. Agatho ... 678
St. Leo II..... 682
St. Benedict II 684
John V 685
Conon 686
St. Sergius I.. 687
John VI 701
John VII 705
Sisinnius 708
Constantine .. 708
St. Gregory II. 715
St. Gregory III 731
St. Zachary.... 741
Stephen II (died before consecration) 752
Stephen III... 752
St. Paul I.... 757
Stephen IV.... 768
Adrian I 772
St. Leo III.... 795
Stephen V 816
St. Paschal I.. 817
Eugenius II... 824
Valentinus ... 827
Gregory IV ... 827
Sergius II 844
St. Leo IV.... 847
Benedict III.. 855
St. Nicholas I. 858
Adrian II 867
(Hadrianus)
John VIII ... 872
Martin II.... 882
Adrian III.... 884
Stephen VI... 885
Formosus 891
Bonifacc VI (reigned only 18 days)... 896
Stephen VII... 896
Romanus 897
Theodorus II. 898
John IX..... 898
Benedict IV... 900
Leo V 903
Christopher .. 903
Sergius III... 904
Anastasius III 911
Landonius ... 913
John X 914
Leo VI 928
Stephen VIII.. 929
John XI 931
Leo VII 936
Stephen IX .. 939
Martin III ... 943
Agapetus II .. 946
John XII 955
Benedict V ... 964
John XIII ... 965
Benedict VI... 972
Domnus II—*Boniface VII* 974
Benedict VII.. 975
John XIV 983
John XV 985
Gregory V—*John XVI*.. 996
Silvester II .. 999
John XVI or XVII 1003
John XVII or XVIII 1003
Sergius IV ... 1009
Benedict VIII. 1012
John XVIII or XIX 1024
Benedict IX (deposed) .. 1033
Gregory VI... 1045
Clement II ... 1046
Damasus II .. 1048
St. Leo IX... 1049
Victor II 1055
Stephen X—*Benedict X*. 1057
Nicholas I ... 1058
Alexander II—*Honorius II*. 1061
Gregory VII (Hildebrand) —*Clement III* 1073
(See vacant 1 year.)
Victor III ... 1086
Urban II 1088
Paschal II ... 1099
Gelasius II—*Gregory VIII* 1118
Callixtus II... 1119
Honorius II .. 1124
Innocent II—*Anacletus II; Victor IV* .. 1130
Celestine II... 1143
Lucius II 1144
Eugenius III.. 1145
Anastasius IV. 1153
Adrian IV (Nicholas Breakspear, an Englishman) 1154
Alexander III—*Victor V; Paschal III* ... 1159
Lucius III.... 1181
Urban III.... 1185
Gregory VIII. 1187
Clement III .. 1187
Celestine III.. 1191
Innocent III.. 1198
Honorius III.. 1216
Gregory IX... 1227
Celestine IV.. 1241
(See vacant 1 year and 7 months.)
Innocent IV... 1243
Alexander IV. 1254
Urban IV 1261
Clement IV... 1265
(See vacant 2 years and 9 months.)
Gregory X.... 1271
Innocent V.... 1276
Adrian V 1276
Vicedominus .. 1276
John XX or XXI 1276
Nicholas III.. 1277
Martin IV.... 1281
Honorius IV.. 1285
Nicholas IV... 1288
(See vacant 2 years and 3 months.)
St. Celestine V 1294
Bonifacc VIII. 1294
Benedict XI... 1303
Clement V (papacy removed to Avignon). 1305
(See vacant 2 years and 3 months.)
John XXII—*Nicholas V at Rome* 1316
Benedict XI .. 1334
Clement VI (*at Avignon*) ... 1342
Innocent VI... 1352
Urban V 1362
Gregory XI (throne restored to Rome) 1370
Urban VI—*Clement VII* 1378
Boniface IX—*Benedict XIII at Avignon*.. 1389
Innocent VII.. 1404
Gregory XII.. 1406
Alexander V.. 1409
John XXIII... 1410
Martin V—*Clement VIII* ... 1417
Eugenius IV—*Felix V* 1431
Nicholas V... 1447
Callixtus III.. 1455
Pius II 1458
Paul II 1464
Sixtus IV ... 1471
Innocent VIII. 1484
Alexander VI.. 1492
Pius III 1503
Julius II 1503
Leo X 1513
Adrian VI ... 1522
Clement VII .. 1523
Paul III 1534
Julius III ... 1550
Marcellus II.. 1555
Paul IV 1555
Pius IV 1559
St. Pius V.... 1566
Gregory XIII.. 1572
Sixtus V 1585
Urban VII ... 1590
Gregory XIV.. 1590
Innocent IX.. 1591
Clement VIII.. 1592
Leo XI 1605
Paul V 1605
Gregory XV .. 1621
Urban VIII .. 1623
Innocent X .. 1644
Alexander VII. 1655
Clement IX... 1667
Clement X ... 1670
Innocent XI.. 1676
Alexander VIII 1689
Innocent XII.. 1691
Clement XI... 1700
Innocent XIII. 1721
Benedict XIII 1724
Clement XII.. 1730
Benedict XIV. 1740
Clement XIII. 1758
Clement XIV.. 1769
Pius VI 1775
Pius VII 1800
Leo XII 1823
Pius VIII 1829
Gregory XVI.. 1831
Pius IX 1846
Leo XIII 1878
Pius X 1903
Benedict XV.. 1914
Pius XI..... 1922

Pope, ALEXANDER, a celebrated English poet, was born at London in 1688. His father was a London merchant and a devout Catholic. Soon after his son's birth the father retired to Binfield, near Windsor. Pope was small, delicate, and much deformed. His education was a desultory one. He picked up the rudiments of Greek and Latin from the family priest, and was successively sent to two schools, one at Twyford, the other in London. He was taken home at the age of twelve, received more priestly instruction, and read so eagerly that his feeble constitution threatened to break down. Before he was fifteen he attempted an epic poem, and at the age of sixteen his *Pastorals* procured him the notice of several eminent persons. In 1711 he published his poem the *Essay on Criticism*, which was followed by *The Rape of the Lock*, a polished and witty narrative poem founded on an incident of fashionable life. His next publications were *The Temple of Fame*, a modernization and adaptation of Chaucer's *House of Fame; Windsor Forest*, a pastoral poem (1713); and *The Epistle of Eloisa to Abelard* (1717). From 1713 to 1726 he was engaged on a poetical translation of Homer's works, the *Iliad* (completed in 1720) being wholly from his pen, the *Odyssey* only half. The pecuniary results of these translations showed a total profit of nearly $45,000. In 1728 he published his *Dunciad*, a mock-heroic poem intended to overwhelm his antagonists with ridicule. It is distinguished by the excessive vehemence of its satire, and is full of coarse abuse. This was followed by *Imitations of Horace* (among the most original of his works), and by *Moral Epistles or Essays*. His *Essay on Man* was published anonymously in 1733, and completed and avowed by the author in the next year. This work is distinguished by its poetry rather than by its reasonings, which are confused and contradictory. In 1742 he added a fourth book to his *Dunciad*, in which he attacked Colley Cibber, then poet-laureate. He died in 1744, and was interred at Twickenham. Pope was vain and irascible, and seems to have been equally open to flattery and prone to resentment; yet he was kindhearted and stanch to his friends, among whom he reckoned Swift, Arbuthnot, and Gay. His great weakness was a disposition to artifice in order to acquire reputation and applause. As a poet, no English writer has carried further correctness of versification. A large number of his letters were published in his own lifetime. There are various editions of Pope's works, the best being that by the Rev. W. Elwin and W. J. Courthope.

Pope, JOHN, soldier, born at Louisville, Kentucky, in 1822; died in 1892. He was graduated from West Point in 1842, served in Florida and in the Mexican war, and was appointed brigadier-general of volunteers in the Civil war. He captured New Madrid and Island No. 10 in the spring of 1862, and in June was given the command of the Army of the Potomac. His army suffered a severe defeat by Lee and Jackson August 29 and 30, 1862. He resigned his command, and was afterwards employed against the Indians in Minnesota. After the war he was put in command of several military departments.

Poperinghe (pō-per-aŋ), a town in Belgium, province West Flanders, with some trade in hops and hemp. It has manufactures of woolens, lace, linen, pottery, etc. Pop. 11,552.

Popish Plot, an imaginary conspiracy which Titus Oates pretended to have discovered in 1678, and by which he succeeded in deluding the mind of the nation over a space of two years, and causing the death of many innocent Catholics. Oates alleged that the plot was formed by the Jesuits and Roman Catholics for the purpose of murdering the king, Charles II, and subverting the Protestant religion Godfrey, a justice of the peace to whom Oates gave evidence, was found dead in a ditch (Oct. 17, 1678), and the papists were accused of his murder, though nothing transpired to substantiate the charge. Parliament met soon afterwards, and the Commons passed a bill to exclude the Catholics from both houses. Oates received a pension, and this encouraged Bedloe, a noted thief and impostor, to come forward and confirm Oates's statements. He also accused several noblemen by name of a design to take up arms against the king. Coleman, secretary to the Duchess of York, a Jesuit named Ireland, and others were tried, condemned, and executed on the testimony of Oates and Bedloe. In 1680 Viscount Stafford was impeached by the Commons, condemned by the Lords, and executed (Dec. 29) as an accomplice of the plot, on the evidence of Oates and two of his associates. Soon after the accession of James II (1685) Oates was convicted of perjury and other crimes. See *Oates*.

Poplar (pop'lar; *Populus*), a well-known genus of hardy deciduous trees, nat. order Salicaceæ, with both barren and fertile flowers in catkins, stamens four to thirty, leaves alternate, broad, with long and slender foot-stalks

flattened vertically, the leaves having generally more or less of a tremulous motion. About eighteen species have been observed, natives of Europe, Central and Northern Asia and North America. Some of the poplars are the most rapid growers of all hardy forest trees. They thrive under a variety of conditions as regards soil, etc., but do best in damp situations. The timber of the poplar is white, light, and soft, and not very valuable. *P. fastigiāta*, the common Lombardy poplar, is well known as a tall tree with slender branches almost upright; it reaches a height of 100 to 150 feet. *P. nigra* is the common black poplar. *P. tremŭla* is the aspen. *P. alba*, the white poplar, often attains a height of 100 feet. *P. balsamifĕra* is the balsam-poplar or tacamahac of the United States; *P. monilifĕra*, the cottonwood of the United States; *P. candicans*, the Ontario poplar.

Poplar Bluff, a city, county seat of Butler Co., Missouri, 73 miles s. w. of Cairo, Illinois, on Missouri Pacific and other railroads. It has spoke mill, shoe factory, flour mills, cotton gin, etc. Pop. (1920) 8042.

Poplin (pop'lin), a kind of finely woven fabric, made of silk and worsted. In the best poplins the warp is of silk and the weft of worsted, a combination which imparts peculiar softness and elasticity to the material; in the cheaper makes cotton and flax are substituted for silk, which produces a corresponding deterioration in the appearance of the stuff. The manufacture of poplin was introduced into Ireland from France in 1775 by Protestant refugees, and Ireland is still famous for its production.

Popocatepetl (po-pō-ka-tā'pet'l, or -tā-pet'l; Aztec, *popoca*, to smoke, and *tepetl*, a mountain), an active volcano in Mexico, in the province of Puebla; lon. 98° 33′ w.; lat. 18° 36′ N. Its height has been estimated at 17,884 feet. The crater is 3 miles in circumference and 1000 feet deep. Forests cover the base of the mountain, but its summit is mostly covered with snow.

Poppy (pop'i), the common name for plants of the genus *Papāver*, type of the order Papaveraceæ. The species of poppy are herbaceous plants, all bearing large, brilliant, but fugacious flowers. The white poppy (*P. somnifĕrum*) yields the well-known opium of commerce. (See *Opium.*) Most of the species are natives of Europe. They often occur as weeds in fields and waste places, and are frequently also cultivated in gardens for ornament. The seeds of the white poppy yield a fixed harmless oil employed for culinary purposes; and the oil-cake is used for feeding cattle. The roots of the poppy are annual or perennial; the calyx is composed of two leaves, and the corolla of four petals; the stamens are numerous, and the capsule is one-celled, with several longitudinal partitions, and contains a multitude of seeds.

Population (pop-ū-lā'shun). The power of propagation inherent in all organic life may be regarded as practically infinite. There is no one species of vegetable or animal which, under favorable conditions as to space, climate, and food (that is to say, if not crowded and interfered with by others), would not in a small number of years overspread every habitable region of the globe. To this property of organized beings the human species forms no exception. And it is a very low estimate of its power of increase if we assume only that, under favorable conditions, each generation might be double the number of the generation which preceded it. Taking mankind in the mass, the individual desire to contribute to the increase of the species may be held to be universal, but the actual growth of population is nowhere left to the unaided force of this motive, and nowhere does any community increase to the extent of its theoretical capacity, even though the growth of population has come to be commonly considered as an indispensable sign of the prosperity of a community. For one thing, population cannot continue to increase beyond the means of subsistence, and every increase beyond actual or immediately attainable means must lead to a destruction of life. But if population is thus actually limited by the means of subsistence, it cannot be prevented by these means from going further than these means will warrant; that is to say, it will only be checked or arrested after it has exceeded the means of subsistence. It becomes then an inquiry of great importance by what kind of checks population is actually brought up at the point at which it is in fact arrested. This inquiry was first systematically treated in an *Essay on the Principle of Population*, published in 1798 by the Rev. T. R. Malthus. (See *Malthus.*) Malthus points out that population increases in a geometrical while the means of subsistence increase only in an arithmetical ratio. And in examining the bearing on each other of the different ratios of increase of human life, and of the means of supporting it, he has deduced a law to the proof of which a considerable por-

tion of his work is devoted. This law is that the energy of reproduction rises above all the ordinary accidents of human life, and the inevitable restraints imposed by the various organizations of human society, so that in all the various countries and climates in which men have lived, and under all the constitutions by which they have been governed, the normal tendency of population has always been to press continuously upon the means of subsistence. Malthus divides the checks on the increase of population into two classes, preventive and positive; the one consisting of those causes which prevent possible births from taking place, the other of those which, by abbreviating life, cut off actual excesses of population. In a further analysis of these checks he reduces them to three — vice, misery, and moral restraint. The proof of his main position is historical and statistical. In regard to the subsidiary inquiry, the most striking point brought out is the rarity of moral restraint and the uniform action, in innumerable forms, of vice and misery. In order that the latter should be weakened in their action, and the former strengthened, it is desirable to have the general standard of living in a community raised as high as possible, and that all may look to the attainment of a position of comfort by the exercise of prudence and energy. In an article read before the Académie des Sciences of Paris in 1887, by M. Levasseur, the following figures were quoted showing the density of population in the great divisions of the world: —

	Area in thousands of sq. miles.	Pop. in millions.	Density per sq. mile.
Europe	3,861	347	90
Africa	12,124	197	16
Asia	16,217	789	47
Oceania	4,247	38	9
N. America ..	9,035	100	8·8
S. America ..	7,066	32	4·6

It may be stated that the conclusion reached by Malthus has been vigorously contested, on various grounds, and still more important is the fact that the story of the human race, since his period, does not sustain his argument. The restraints upon increase imposed by human society are much greater in effect than he estimated. It is true that the population of the earth, and especially of Europe, has made a very great increase within a century past, reaching by the opening of the twentieth century the great total of about 1,500,000,000. The effects of war, pestilence and famine have been very largely eliminated, and medical science has to-day reached a stage of development that goes far to remove one of the great checks to increase of population. But this growth in numbers has been accompanied by a greater increase in the means of subsistence and the people of to-day live in superior comfort and security, and with a considerably longer span of life, than their ancestors of a century ago. Moreover, the food-raising capacity of the earth is increasing at an encouraging rate, and no one can predict to what a high level it may reach in the future. Despite this, however, the limit of comfortable life would certainly be reached and passed were there not a falling off in fecundity as a result of modern conditions of society, that seems likely to operate as an effective check to a serious overplus of population. In recent decades the birth-rate has been falling off in all progressive countries in a very significant manner. This is indicated in various parts of Europe, and in France has reached such a level that there is an actual decrease of population. A similar condition exists elsewhere. Thus in Massachusetts, from 1883 to 1897, the birth-rate of native married women was only five-ninths of that of women of foreign birth, a fact due probably to their superior condition of life. Several causes lead in this direction. It is well known that any stratum of population that is hopeless of bettering its condition is very apt to breed recklessly, and this fact has kept such countries as China and India at or near the starvation limit for generations past. But where comfort exists through the great bulk of a population and the prospect of better conditions leads to the exercise of prudence and restraint, there is sure to be a falling off in the birth-rate. In this the opening of widespread industrial careers to women aids. Later marriages take place, celibacy increases, care is taken to prevent the birth of an undue number of children, and other influences act to reduce the birth-rate. For these reasons it would appear that, when prosperity extends widely over the earth, the increase of population seems sure to decline, while the development of the food supply promises a steady enhancement of the conditions of human comfort and prosperity.

Porbandar (por-bun'dur), a town of India, chief town of a native state of the same name, in the political agency of Kattyawar, Bombay

It is built on a creek on the S. W. coast of Gujerat, and maintains a considerable trade with Bombay and Malabar. Pop. 24,620.

Porbeagle (por'bē-gal), a fish of the Lamnidæ family of sharks. Three species have been described; the best known is *Lamna cornubica*, which occurs in the North Atlantic. It attains to a length of 10 feet, and feeds chiefly on fishes. The porbeagle has two dorsal fins, a wide mouth, lanceolate teeth, and very wide gill-openings.

Porcelain (pors'lān). See *China-ware* and *Pottery*.

Porcelain Crab (*Porcellāna*), a name for certain crustacea, typical of the family Porcellanidæ, small, smooth crabs, of which two are British: *P. platychēles*, the hairy, and *P. longicornis*, the minute, porcelain crab.

Porch (pōrch), an exterior appendage to a building, forming a covered approach to one of its principal doorways. The porches in some of the older churches are of two stories, having an upper apartment to which the name *parvis* is sometimes applied.— *The Porch* was a public portico in Athens (the *Stoa Poikile*), where the philosopher Zeno taught his disciples. Hence *The Porch* is equivalent to the *School of the Stoics*.

Porcia (pōr'she-a), an ancient Roman lady, a daughter of Cato of Utica. She first married M. Bibulus, Cæsar's colleague in the consulship (B.C. 59), by whom she had three children. Bibulus died in B.C. 48, and in B.C. 45 she married M. Brutus, who afterwards became the assassin of Cæsar. After the death of Brutus she put an end to her life.

Porcupine (por'kū-pīn), a name of a family of rodent quadrupeds, the best-known species of which belong to the genus *Hystrix*. The body is covered, especially on the back, with the so-called *quills*, or dense solid spine-like structures, intermixed with bristles and stiff hairs. There are two incisors and eight molar teeth in each jaw, which continue to grow throughout life from permanent pulps. The muzzle is generally short and pointed, the ears short and rounded. The anterior feet possess four, and the hinder feet five toes, all provided with strong, thick nails. The common or crested porcupine, *Hystrix cristāta*, found in Southern Europe and in Northern Africa, is the best-known species. When fully grown it measures nearly 2 feet in length, and some of its spines exceed 1 foot. Its general color is a grizzled, dusky black. The spines in their usual position lie nearly flat, with their points directed backwards; but when the animal is excited they are capable of being raised. The quills are loosely inserted in the skin, and may, on being violently shaken, become detached — a circumstance which may probably have given rise to the purely fabulous statement that the animal possessed the power of actually ejecting its quills like arrows or darts at an enemy. These animals burrow during the day, and at night search for food, which consists chiefly of vegetable matter. Of the American species, the Canadian or North American porcupine (*Erethizon dorsāta*) is the best known. It is about 2 feet long, and of slow and sluggish habits. The quills in this species are short, and are concealed among the fur. The ears are short, and hidden by the fur. The tail is comparatively short. The genus *Cercolabes* of South America possesses a distinctive feature in the elongated prehensile tail, adapting it for arboreal existence. These latter forms may thus be termed 'tree porcupines.' In length the typical species of this genus averages 1½ feet, the tail measuring about 10 inches.

Porcupine (*Hystrix cristāta*).

Porcupine Ant-eater. See *Echidna*.

Porcupine Crab (*Lithōdes hystrix*), a species of crab covered with spines, found off the coasts of Japan. It is dull and sluggish in its movements.

Porcupine Fish (*Diodon hystrix*), a fish of the order Plectognathi, found in the tropical seas. It is about 14 inches long, and is covered with spines or prickles.

Porcupine Grass (*Triodia* or *Festūca irritans*), a brittle Australian grass which it is proposed to utilize in the manufacture of paper.

Porcupine Wood, a name for the wood of the cocoanut palm.

Pordenone (pōr-dā-nō′nā), a town of North Italy, province of Udine, 40 miles N. N. E. of Venice. It is a well-built, stirring place, with manufactures of linen, copper utensils, paper and glass, and a considerable trade. Pop. 8425.

Pordenone, Il (so-called from his birthplace, Pordenone, his true name being Giovanni Antonio Licinio), or Regillo da Pordenone, a painter of the Venetian school, born about 1484. He executed many works for his native place; some also for Mantua, Vicenza, and Genoa; but his greatest works were for Venice. He died at Ferrara in 1540. Specimens of his works are to be found in many of the principal galleries of Europe.

Porgie (por′ji; *Pagrus argyrops*), a fish of the family Sparidæ, with an oblong body, scaly cheeks, and one dorsal fin, found off the coasts of the United States. It is one of the most important food fishes, and attains a length of 18 inches and a weight of 4 lbs. The name is also given to the Menhaden, which see.

Porifera (pō-rif′e-ra; 'pore-bearing'), a term occasionally employed to designate the sponges.

Porism (pō′rizm), a name given by ancient geometers to a class of mathematical propositions having for their object to show what conditions will render certain problems indeterminate. Playfair defined a porism thus: 'A proposition affirming the possibility of finding such conditions as will render a certain problem indeterminate, or capable of innumerable solutions.'

Pork, the flesh of swine, is one of the most important and widely-used species of animal food. Pork is coarser and ranker than beef or mutton, but when of good quality and well cured it develops a richness and delicacy of flavor in marked contrast with the dryness and insipidity of other salted meat. The abundance and digestive quality of its fat render it a suitable diet for cold climates. The swine was forbidden to be eaten by the Mosaic law, and is regarded by the Jews as especially typical of the unclean animals. Other Eastern nations had similar opinions as to the use of pork. Pork contains less fibrin, albuminous and gelatinous matter than beef or mutton. It is largely produced in the United States and exported in great quantities to Europe.

Porosity (pō-ros′i-ti), the name given to a property possessed by all bodies, in consequence of which their molecules are not immediately contiguous to one another, but are separated by intervening spaces or pores.

Porphyrio (por-fir′yo), a genus of birds of the rail family, including the *P. hyacinthinus* (purple or hyacinthine gallinule), a bird found in Europe, Asia and Africa, and remarkable for the structure of its beak and the length of its legs. It feeds on seeds and

Porphyrio hyacinthinus (Purple Gallinule).

other hard substances, and lives in the neighborhood of water, its long toes enabling it to run over the aquatic plants with great facility. It is about 18 inches long, of a beautiful blue color, the bill and feet red.

Porphyry (por′fi-ri), originally the name given to a very hard stone, partaking of the nature of granite, susceptible of a fine polish, and consequently much used for sculpture. In the fine arts it is known as *Rosso Antiquo*, and by geologists as *Red Syenitic Porphyry*. It consists of a homogeneous felspathic base or matrix, having crystals of rose-colored felspar, called oligoclase, with some plates of blackish hornblende, and grains of oxidized iron ore embedded, giving to the mass a speckled complexion. It is of a red or rather of a purple and white color, more or less variegated, the shades being of all gradations from violet to a claret color. Egypt and the East furnish this material in abundance. It also abounds in Minorca, where it is of a red-lead color, variegated with black, white, and green. Pale and red porphyry, variegated with black, white, and green, is found in separate nodules in Germany, England, and Ireland. The art of cutting porphyry as practiced by the ancients appears to be now quite lost. In geology the term porphyry is applied to any unstratified or igneous rock in which detached crystals of felspar or some other mineral are diffused through a base of other mineral composition. Porphyry is known as felspar porphyry, claystone porphyry, porphyritic granite, and porphy-

ritic greenstone. In America it is often associated with gold.

Porphyry (Porphyrios), a Greek philosopher of the Neo-Platonic school, celebrated as an antagonist of Christianity, born about 233 A.D. He studied under Longinus at Athens, and at the age of thirty placed himself under the teaching of Plotinus at Rome. About 268 he went to Sicily, where he is said to have written his treatise against the Christians, which was publicly burned by the Emperor Theodosius, and is only known from fragments in the authors who have refuted him. Porphyry recognized Christ as an eminent philosopher, but he charged the Christians with corrupting his doctrines. He was a voluminous writer, but few of his works are extant. The most important are his lives of Plotinus and Pythagoras. Porphyry died about 304 or 306.

Porpoise (por'pus), a genus of cetacean mammalia, belonging to the family Delphinidæ (dolphins, etc.). The common porpoise (*Phocæna communis*) is the smallest and most familiar of all Cetacea, and occurs plentifully in the Atlantic. It attains an average length of 5 feet. The front of the head is convex in form, and has the spiracle or blowhole in the middle line. The eyes and ears are small. The caudal fin is horizontal and flattened. The neck is

Porpoise (*Phocæna communis*).

very short. The forelimbs project from the body. No hind limbs are developed. The teeth are small with blunted crowns. The stomach is in three portions. No olfactory nerves exist. The porpoise feeds almost entirely on herrings and other fish, and herds or 'schools' of porpoises follow the herring-shoals, among which they prove very destructive. An allied species is the round-headed porpoise, or 'caaing whale' of the Shetlanders. These latter measure from 20 to 24 feet in length, and are hunted for the sake of the oil. See *Caaing Whale*.

Porpora (por'po-ra), Nicolò, an Italian composer, was born at Naples about 1685, and was the favorite pupil of Scarlatti. His first opera, *Ariana e Teseo*, was brought out at Vienna, in 1717. By 1722 he had composed five operas and an oratorio. In 1725 he went to Vienna, and subsequently paid professional visits to Rome, Venice, and Dresden. In 1729 a party in London, which was discontented with Händel, opened a second opera house, and called Porpora to take the direction of it. Porpora was successful, and Händel after a heavy pecuniary loss gave up the theater, and devoted himself to oratorio. Porpora afterwards returned to the continent, and died in great poverty at Naples in 1767.

Porsenna (por-sen'a), or Por'sena, Lars, the king of the Etrurian city Clusium, according to the legend narrated by Livy, who received the Tarquins when they were expelled from Rome, and after in vain endeavoring to effect their restoration by negotiation, advanced with an army to Rome. The legendary story is that he was checked by Horatius Cocles, who defended the bridge over the Tiber leading to Rome. Modern critics have held that Rome was completely conquered by him.

Porson (por'son), Richard, critic and classical scholar, professor of Greek in the University of Cambridge, was born in 1759, at East Ruston, in Norfolk, where his father was parish clerk; and died at London in 1808. In 1777 he entered Trinity College, Cambridge, where he highly distinguished himself in classics, and in 1782 took the degree of B.A. and was chosen to a fellowship. This he resigned in 1792, since it could no longer be held by a layman, and Porson declined to take holy orders. Soon after he was unanimously elected Greek professor, a post which, however, brought him an income of only $200 a year. He edited and annotated several Greek works, especially four of the dramas of Euripides, and enjoyed the reputation of being one of the best Greek scholars and critics of the age, notwithstanding which he experienced little patronage, a circumstance partly attributable to his intemperate habits. In 1805 he was appointed librarian to the London Institution. He was familiar with English literature, and wrote for some of the chief periodicals of the day.

Port, a kind of wine. See *Port Wine*.

Port, a harbor or haven, or place where ships receive and discharge cargo. A *free port* is one at which the goods imported are exempted from the payment of any customs or duties, as long as they are not conveyed into the interior of the country.

Port, the name given to the left side of a ship (looking towards the prow), as distinguished from the starboard or right side. Formerly *larboard* was used instead of *port.*

Port Adelaide (pōrt ad'ē-lād), a seaport of South Australia, the port of the city of Adelaide, with which it is connected by a railway of 7½ miles. It is on the estuary of the Torrens, which enters the Gulf of St. Vincent, and is the chief port of S. Australia. The harbor accommodation has been recently greatly improved, extensive wharves, piers, etc., have been provided, but the entrance is still partly obstructed by bars. Pop. 24,015.

Portadown (pōrt-a-doun'), a market town, Ireland, in the county and 9 miles northeast of Armagh, on the Bann, which is navigable to vessels of 90 tons. Pop. 11,727.

Portage (port'aj), a city, county seat of Columbia Co., Wisconsin, on the Wisconsin River, at head of navigation, 30 miles N. of Madison. It is on the ship canal that connects the Wisconsin and Fox rivers, and has hosiery and knitting mills, plow factory, and farm interests. Pop. (1920) 5582.

Portage la Prairie, a town of Manitoba, Canada, 56 m. W. of Winnipeg. It has railroad shops, grain elevators. Pop. 5982.

Portal Circulation, a subordinate part of the venous circulation, belonging to the liver, in which the blood makes an additional circuit before it joins the rest of the venous blood. The term is also applied to an analogous system of vessels in the kidney.

Port Angeles, a city, county seat of Clallam Co., Washington, on Strait of Juan de Fuca, 80 miles N. W. of Seattle. The principal industries of the city are lumber and shingles, pulp paper manufacturing, canneries. Pop. (1920) 5351.

Port Arthur, a seaport of Manchuria, at the S. W. extremity of Liao Tung peninsula, with a splendid, nearly landlocked harbor, ice-free for nearly the whole year. It is of special interest for its history. Fortified and made the chief naval station of China in 1891, it was taken in 1894 by the Japanese, who destroyed its fortifications. Japan was obliged to restore it to China, and in 1898 it was leased to Russia, which country fortified it and made it a great naval station, and the chief terminus of the Trans-Siberian Railway. Though apparently well-nigh impregnable, it was taken by the Japanese in 1905 as a result of war with Russia, and is held by them.

Port Arthur, a city and seaport of Jefferson Co., Texas, on Sabine Lake, 12 miles from the Gulf of Mexico, which is reached through a ship canal 270 feet wide and 27 feet deep. It is an oil center and shipping point. Known as the Pan-American Gateway. Pop. (1910) 7663; (1920) 22,251.

Port Arthur, a city and port of entry at head of navigation on Lake Superior, capital of Thunder Bay District, Ontario. It has immense grain elevators, shipbuilding yards, pulp mills, dry docks, etc.; also has extensive lumber and mining interests. Pop. 18,000.

Port-au-Prince (por-tō-prans), capital of the Republic of Hayti, on the western side of the island, at the southeast extremity of the bay of the same name. It is built in a low and unhealthy spot, consists chiefly of wooden houses, and contains an ungainly palace, a senate-house, a Roman Catholic church, a custom-house, mint, a hospital, lyceum, etc. Pop. about 100,000.

Port Chester, a village and summer resort of Westchester Co., New York, on Long Island Sound, 26 miles N. E. of New York City. It has large planing mills, laundries, shirt and sheet factories, and stove and iron bolt works. Pop. (1910) 12,809; (1920) 16,573.

Portcullis (pōrt-kul'is), a strong grating of timber or iron, resembling a harrow, made to slide in vertical grooves in the jambs of the entrance-gate of a fortified place, to protect the gate in case of assault.

Port Darwin (där'win), an inlet on the northern coast of Australia, the chief harbor of the Northern Territory of South Australia, about 2000 miles from Adelaide. The port town is Palmerston.

Port Durnford (durn'ford), a good harbor on the east coast of Equatorial Africa, in lat. 1° 13′ S., at the mouth of the Wabuski River.

Porte (pōrt), OTTOMAN, or SUBLIME PORTE, the common term for the Turkish government. The chief office of the Ottoman Empire is styled *Babi Ali,* lit. the High Gate, from the gate (*bab*) of the palace at which justice was administered; and the French translation of the term being *Sublime Porte,* this has come into common use.

Port Elizabeth, a seaport in the east of Cape Colony, on Algoa Bay. It contains many fine buildings, including a town-house, custom-house, hospitals, etc., and is the

great emporium of trade for the eastern portion of the colony as well as for a great part of the interior, being the terminus of railways that connect it with Kimberley and other important inland towns. It is now a greater center of trade than Cape Town. Pop. 32,959.

Porter (pōrt'er), ANNA MARIA, was born about 1781. She produced a number of novels, which enjoyed considerable popularity in their day. Died in 1832.

Porter, DAVID, naval officer, was born at Boston, Massachusetts, in 1780. Entering the navy, he was put in command of the frigate *Essex* in 1813, and captured the British war vessel *Alert* and a number of merchantmen. In 1813 he cruised in the Pacific and took a large number of prizes. In March, 1814, the *Essex* was attacked at Valparaiso by two British war vessels and was captured after a long and desperate resistance. He was naval commissioner 1815-23, chargé d'affaires at Constantinople in 1831, and minister in 1839. He died in 1843.

Porter, DAVID DIXON, naval officer, son of the preceding, was born in Chester, Pennsylvania, in 1813. He entered the United States navy as midshipman in 1829. He served during the Mexican war, and was in every action on the coast. At the beginning of the Civil war he was placed in command of the steam-frigate *Powhatan*. In command of a mortar fleet he took an active part in the reduction of Forts Jackson and St. Philip on the Mississippi; also aided in the capture of Vicksburg and Arkansas Post. For these services he was made rear-admiral. In 1865 he aided General Terry in the capture of Fort Fisher. In 1866 he was promoted vice-admiral, and in 1870 appointed admiral, the highest rank in the navy. He died in 1891.— His brother, WILLIAM D. (1809-64), also served in the navy in the Civil war, destroyed the iron-clad ram *Arkansas* in 1862, and was promoted commodore.

Porter, FITZ-JOHN, soldier, was born in New Hampshire, and was graduated from West Point in 1845. He became a captain in 1856 and a colonel in 1861. For his courage at the battles of Gaines's Mill and Malvern Hill in 1862 he was appointed major-general of volunteers. Though present with his corps at the second battle of Bull Run, he took no part in the contest, and was accused of delinquency by General Pope, tried by court-martial, and dismissed from the service. The charges against him were re-examined under President Hayes and he was found not guilty and was reinstated as colonel in 1886. He was police commissioner of New York in 1884-88, and held other positions there, dying in 1901.

Porter, JANE, an English novelist, was born at Durham in 1776; died in 1850. Her *Thaddeus of Warsaw* and *Scottish Chiefs* were long popular.

Porter, NOAH, philosopher and writer, born at Farmington, Connecticut, in 1811. Graduating at Yale College in 1831, he was ordained pastor of the Congregational Church, New Milford, Conn., in 1836, and in 1843 settled at Springfield, Mass. Returning to Yale in 1846 as professor of metaphysics and moral philosophy, he was elected president in 1871, and continued to hold that position till 1886. Among his works are *Historical Discourses*, *The Human Intellect*, *Books and Reading*, *The Science of Nature versus the Science of Man*, *The Elements of Intellectual Philosophy*, *The Elements of Moral Science*, etc. He also edited an edition of *Webster's Dictionary*. He died in 1892.

Porter, SIR ROBERT KER, artist and traveler, born at Durham about 1775; died at St. Petersburg in 1842. He was brother to Jane and Anna Maria Porter, became a student at the Royal Academy, painted several large battle-pieces, and in 1804 was invited to Russia by the emperor, who made him his historical painter. In 1808 he joined the British forces under Sir John Moore, whom he accompanied to Spain. Subsequently he returned to Russia and married the Princess Sherbatoff. In 1813 he obtained the honor of knighthood.

Porter, WILLIAM SYDNEY (pseudonym 'O. Henry'), author, born at Greensboro, N. C., in 1867; died in 1910. He became a journalist and later a short story writer for magazines and newspapers. In this field he was very prolific and highly capable, and his stories grew widely popular.

Port-Glasgow (glas'kō), a seaport of Scotland, in Renfrewshire, on the southern bank of the estuary of the Clyde above Greenock. When the Clyde was deepened so as to enable large vessels to sail up to Glasgow, the trade of Port-Glasgow rapidly diminished. Recently, however, it has somewhat revived. The staple industries are shipbuilding and marine engineering; and there are manufactures of sailcloth, ropes, etc. Pop. 16,840.

Port Hope, a town of Canada, on the northern shore of Lake Ontario, 63 miles N. E. of Toronto by the Grand Trunk Railway. The town

is beautifully situated at the base and on the declivity of the hills overlooking the lake. It has active industries, and a good trade in timber, grain and flour. Pop. (1911) 5089.

Port Huron (hū'run), a city of Michigan, county seat of St. Clair Co., on the St. Clair River, at the southern extremity of Lake Huron and opposite Sarnia, Canada, with which it is connected by a tunnel under the river. It is a railroad terminus, and has daily steamship connections with Detroit, 62 miles distant. It is a popular resort as well as a manufacturing city. Products are food and beverages, ships and docks, machinery and metals, railroad cars and tools, oils and chemicals, textiles, auto parts, etc. Pop. (1910) 18,863; (1920) 25,964.

Portici (por'ti-chē), a town in Southern Italy, on the Gulf of Naples, at the base of Vesuvius. It is about 5 miles east from the city of Naples, but is connected with it by the long village of S. Giovanni a Teduccio. (See plan at *Naples.*) It is delightfully situated, has many elegant villas, and is surrounded by fine country seats. It possesses a royal palace, now the property of the municipality of Naples. An active fishery is carried on. Pop. 14,329.

Portico (por'ti-kō), in architecture, a kind of porch before the entrance of a building fronted with columns, and either projecting in front of the building or receding within it. Porticoes are styled tetrastyle, hexastyle, octostyle, decastyle, according as the columns number four, six, eight, or ten.

Port Jackson (jak's'n), a beautiful and extensive inlet on the east coast of Australia in New South Wales, forming a well-sheltered harbor on the south shore of which Sydney stands. See *Sydney.*

Port Jervis (jėr'vis), a city and summer resort of Orange Co., New York, on the Delaware River, above the mouth of the Neversink, 88 miles N. W. of New York. It is surrounded by attractive scenery, and has extensive railroad shops, iron foundries, glassworks, glove and underwear factories, silk mills, etc. Pop. (1910) 9564; (1920) 10,171.

Portland (pōrt'land), a seaport of Maine, county seat of Cumberland Co., on a peninsula at the western extremity of Casco Bay, 108 miles N. by E. of Boston. It is a picturesque and well-built city, with handsome public buildings, and abundance of trees in many of its streets. This has given it the name of 'Forest City.' The trade, both maritime and inland, is extensive, Portland being the terminus of three important railways. The harbor is easy of access, capacious, deep enough for the largest vessels, and never obstructed with ice. Shipbuilding is largely carried on, and it has a valuable foreign trade, especially with London, Liverpool and Glasgow, and a large coastwise trade. It is also extensively engaged in the cod and mackerel fisheries. Its industries include extensive canning and packing works, oil refining, engine and stove works, car and locomotive shops, heavy iron forgings, and other manufactures. Portland was first settled in 1632. Pop. (1910) 58,571; (1920) 69,272.

Portland, a city, county seat of Jay Co., Indiana, on the Salamonia River, 30 miles N. E. of Muncie. It has oil wells, lumber and flour mills and wood-working and other industries. Pop. (1920) 5958.

Portland, the chief city of Oregon, and county seat of Multnomah Co., situated on the Willamette River, about 12 miles from its confluence with the Columbia and at the head of navigation. It is the jobbing and financial center of the Pacific Northwest and is an important commercial and shipping point, having regular steamship connection with San Francisco and other coast cities, also with Asiatic ports. It is extensively engaged in slaughtering and packing, in ship and boat building, and has numerous manufactures. Its exports include wheat, lumber, fruit, flour, wool, salmon, etc. The city is attractively built, and was the seat of the Lewis and Clark Exhibition of 1905. Pop. (1910) 207,214; (1920) 258,288.

Portland, Isle of, a peninsula, supposed to have been formerly an island in the county of Dorset, 50 miles W. S. W. of Southampton, in the British Channel. It is attached to the mainland by a long ridge of shingle, called the Chesil Bank, and it consists chiefly of the well-known Portland stone (q. v.), which is chiefly worked by convicts, and is exported in large quantities. One of the most prominent objects in the island is the convict prison, situated on the top of a hill. It contains about 1500 convicts. The south extremity of the island is called the *Bill of Portland,* and between it and a bank called the Shambles is a dangerous current called the *Race of Portland.* See also *Portland Breakwater.*

Portland Beds, in geology, a division of the Upper Oölites occurring between the Purbeck Beds and the Kimmeridge Clay, consisting of beds of hard oölitic limestone and freestone interstratified with clays and

Photo by Weister Co., Portland

PORTLAND AND THE "PRIDE OF OREGON"

A bird's-eye view of the largest city in Oregon. In the distance is Mount Hood; its white summit is on the very crest of the Cascades, some twenty miles south of the Columbia River.

resting on light-colored sands which contain fossils, chiefly mollusca and fish, with a few reptiles. They are named from the rocks of the group forming the isle of *Portland* in Dorsetshire, from whence they may be traced through Wiltshire as far as Oxfordshire.

Portland Breakwater, the greatest work of the kind in Britain, runs from the northeast shoulder of the Isle of Portland (which see) in a northeasterly direction, with a bend towards the English Channel, and forms a complete protection to a large expanse of water between it and Weymouth, thus forming an important harbor of refuge. It consists of a sea-wall 100 feet high from the bottom of the sea, 300 feet thick at the base, and narrowing to the summit, and consists of two portions, one connected with the shore, 1900 feet in length, and another of 6200 feet in length, separated from the former by an opening 400 feet wide, through which ships can pass straight to sea with a northerly wind. It is protected by two circular forts, the principal at the north end of the longer portion. The work, which was carried out by government, occupied a period of nearly twenty-five years, ending with 1872. It is constructed of Portland stone.

Portland Cement, a well-known and largely used cement, which derives its name from its near resemblance in color to Portland stone. It is made from chalk and clay or mud in definite proportions. These materials are intimately mixed with water, and formed into a sludge. This is dried, and when caked is roasted in a kiln till it becomes hard. It is afterwards ground to a fine powder, in which state it is ready for market. This cement is much employed along with gravel or shivers for making artificial stone. A month after it is set it forms a substance so hard as to emit a sound when struck.

Portland Stone, is an oölitic limestone occurring in great abundance in the Isle of Portland, England. (See *Portland.*)

Portland Vase (or BARBERINI), a celebrated ancient cinerary urn or vase, of the third century after Christ, found in the tomb of the Emperor Alexander Severus. It is of transparent, dark-blue glass, coated with opaque, white glass, which has been cut down in the manner of a cameo, so as to give on each side groups of figures delicately executed in relief, representing the marriage of Peleus and Thetis. In 1810 the Duke of Portland, its owner, allowed it to be placed in the British Museum, where it remained intact till the year 1845, when it was maliciously broken. The pieces were carefully collected and very successfully reunited.

Port Louis (lö'is), the capital of the island of Mauritius, on the northwest coast, beautifully situated in a cove formed by a series of basaltic hills, partially wooded, varying in height from 1058 to 2639 feet. The site is rather unhealthy. The streets, though rather narrow, are laid out at right angles and adorned with acacias. A mountain stream traverses the town, and an open space like a racecourse lies behind it. There are barracks, theater, public library, botanic garden, hospital, etc., but no buildings of architectural importance. The town and harbor are protected by batteries. Pop. 53,978.

Port Lyttelton. See *Lyttelton.*

Port Mahon (mȧ-ōn'), the capital of the island of Minorca, situated on a narrow inlet in the S. E. of the island. The harbor, protected by three forts, is one of the finest in the Mediterranean, and is capable of accommodating a large fleet of ships of the heaviest tonnage. Pop. 17,975.

Port Natal. See *Durban.*

Porto. Same as *Oporto.*

Porto Alegre (ȧ-lā'gre), a town in Brazil, capital of the province of Rio Grande do Sul, near the northwest extremity of Lake Patos, 150 miles N. N. W. of Rio Grande. It is well and regularly built. The harbor is much visited by merchant vessels, and it has an important trade Pop. about 100,000.

Portobello (pōr′tō-bel′lō), a parliamentary burgh (Leith district) of Scotland, 3 miles east of the city of Edinburgh on the Firth of Forth, much frequented as a summer resort. Pop. 9200.

Porto Bello, a seaport of Panamá, on the Caribbean Sea, 40 miles N. N. W. of Panama. Formerly of some importance, it is now a poor and miserable place, although its fine harbor still attracts some trade.

Porto Cabello (kä-bā′yō), a town of Venezuela, on the Caribbean Sea. It has a capacious and safe harbor. Pop., with district surrounding, about 14,000.

Porto Ferrajo (fer-rä′yō), chief town of the island of Elba, on the north coast. Pop. 4222. Napoleon I resided here from May 5, 1814, to February 26, 1815.

Port of Spain, the chief town of the island of Trinidad. It is a pleasant, well-built town; has two cathedrals, government house, town-hall, courthouse, theater, barracks, etc. It is a railway terminus, and has an active trade. It is a port of call for many lines of ocean steamers. Pop. (1911) 59,658.

Port Orchard (changed from name of Sidney in 1894), capital of Kitsap Co., Washington. It is situated on Port Orchard Bay, an inlet of Puget Sound, 18 miles w. of Seattle. It is a naval station of the United States, with a very large dry dock, 600 feet long by 75 wide, and capable of holding vessels with a draught of 30 feet. Pop. 1393.

Porto Rico (pōr′to rē′ko; Sp., *Puerto Rico*), formerly one of the Spanish West Indian Islands, the fourth in size of the Antilles, east of Hayti; area, with subordinate isles, 3596 square miles. The island is beautiful and very fertile. A range of mountains, covered with wood, traverses it from east to west, averaging about 1500 feet in height, but with one peak 3678 feet high. In the interior are extensive savannahs; and along the coast tracts of fertile land, from 5 to 10 miles wide. The streams are numerous, and some of the rivers can be ascended by ships to the foot of the mountains. There are numerous bays and creeks. The chief harbor is that of the capital, San Juan de Porto Rico; others are Mayaguez, Ponce, and Arecibo. The climate is rather healthy except during the rainy season (Sept.–March). Gold is found in the mountain streams. Copper, iron, lead, and coal have also been found; and there are saline or salt ponds. The chief products are sugar, rum, molasses, coffee, cotton, tobacco, hides, live stock, dyewoods, timber, rice, etc. There are extensive phosphate deposits along the south coast. The island was discovered by Columbus in 1493, and was settled by the Spaniards in 1510, who soon exterminated the natives. Invaded by the United States, July, 1898, it was ceded by Spain to that government by the treaty of peace. An excellent school system was introduced and attendance made compulsory. The University of Porto Rico is at Rio Piedras, near San Juan. The government is vested in a governor and legislative assembly. Collective American citizenship has been granted the inhabitants. Pop. (1910) 1,118,012; (1920) 1,297,772.

Porto Rico, San Juan de, the capital and principal seaport of the above island, on its north coast, stands upon a small island connected with the mainland by a bridge, is surrounded by strong fortifications, and is the seat of the government. Pop. (1910) 48,716; (1920) 70,707.

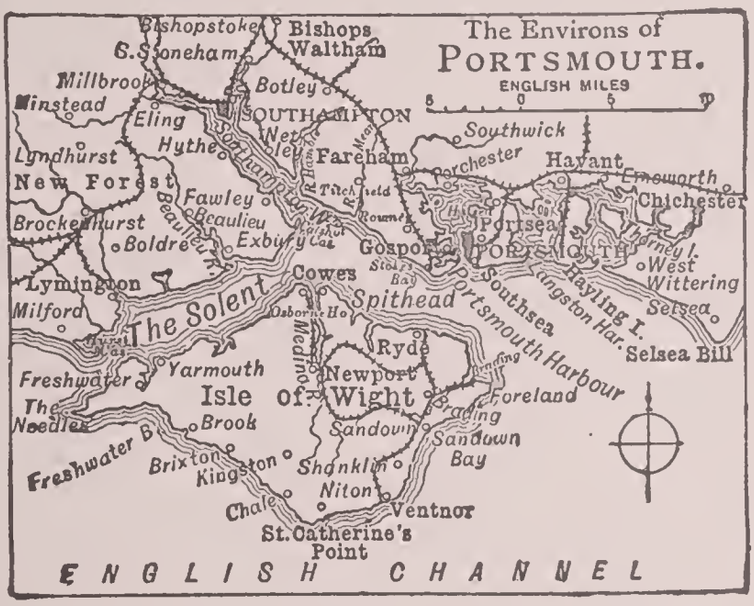
Port Phillip, Australia. See *Melbourne.*

Port Royal (roi′al), a fortified town on the southeast coast of Jamaica, on a tongue of land, forming the south side of the harbor of Kingston. Its harbor is a station for British ships of war, and it contains the naval arsenal, hospital, etc. It has been often damaged by earthquakes. Pop. 14,000.

Port Royal, a Cistercian convent in France, which played an important part in the Jansenist controversy. It was situated near Chevreuse (department of Seine-et-Oise), about 15 miles s. w. of Paris, and was founded in 1204 by Matthieu de Montmorency, under the rule of St. Bernard. Port Royal, like many other religious houses, had fallen into degenerate habits, when in 1609 the abbess Jacqueline Marie Angélique Arnauld undertook its reform. The number of nuns increased considerably under her rule, and in 1625 they amounted to eighty. The building thus became too small, and the insalubrity of the situation induced them to seek another site. The mother of the abbess purchased the house of Cluny, in the Faubourg Saint Jacques, Paris, to which a body of the nuns removed. The two sections of the convent were now distinguished as Port Royal des Champs and Port Royal de Paris. About 1636 a group of eminent literary men of decided religious tendencies took up their residence at Les Granges, near Port Royal des Champs, where they devoted themselves to religious exercises, the education of youth, etc. These were re-

PORTO RICO
Scale of Miles
0 5 10 15 20
Railroads
Railroads Projected
Improved Roads
Capital
Size of type indicates relative importance of places
C.S.HAMMOND & CO.,N.Y.
Long. West from Greenw.
ATLANTIC OCEAN
CARIBBEAN SEA
SAN JUAN
Mayaguez
Ponce
Arecibo
Aguadilla
Quebradillas
Rincon
Aguada
Moca
San Sebastian
Lares
Las Marias
Utuado
Adjuntas
Jayuya
Hormigueros
San German
Cabo Rojo
Sabana Grande
Yauco
Guayanilla
Penuelas
Juana Diaz
Coamo
Santa Isabel
Salinas
Guayama
Patillas
Maunabo
Yabucoa
Humacao
Naguabo
Fajardo
Ceiba
Caguas
Cayey
Aibonito
Barranquitas
Comerio
Cidra
Las Cruces
Gurabo
Juncos
San Lorenzo
Las Piedras
Rio Piedras
Bayamon
Toa Baja
Toa Alta
Vega Baja
Vega Alta
Dorado
Manati
Barceloneta
Ciales
Morovis
Corozal
Naranjito
Carolina
Trujillo Alto
Loiza
Rio Grande
Canovanas
Mameyes
Luquillo
Camuy
Hatillo
Isabela
Florida
Isolina
Citrus
Barrio Pileta
Altosano
Consumo
Los Vegas
Maricao
Lajas
Boqueron
Parguera
Guanica
Aldea Villalba
Barrio Tibes
Tallaboa
Mata de Platano
Barrio Nuevo
Aguas Buenas
La Muda
Martin Pena
Central Aguirre
Arroyo
ISLANDS WEST OF PORTO RICO
Same Scale as Main Map
MONITO I.
MONA I. (To Porto Rico)
DESECHEO I.
North Cape
West Pt.
East Cape
Playa Pajaro
Caigo o no Caigo Pt.
ISLANDS EAST OF PORTO RICO
Same Scale as Main Map
VIEQUES I.
Vieques
Esperanza
CULEBRA I.
Culebra
CULEBRITA I.
VIEQUES SOUND
Virgin Passage
Hermanos Passage
Barriles Passage
PALOMINOS I.
HICACOS I.
PINEROS I.
CUCARACHA ROCK
CABALLO ROCK
GRAMPUS SHOALS
SANTIAGO CAY
East Pt.

garded as forming a joint community with the nuns of Port Royal, among whom most of them had relatives. Among the number were Antoine Arnauld, Arnauld d'Andilly, Lemaistre de Sacy and his two brothers, all relatives of the abbess; Nicole, and subsequently Pascal, whose sister Jacqueline was at Port Royal. The educational institution, thus founded, which flourished till 1660, became a powerful rival to the institution of the Jesuits, and as the founders adopted the views of Jansenius (see *Jansenists*), subsequently condemned by the pope, a formidable quarrel ensued, in which the Port-Royalist nuns, siding with their male friends, became subject to the relentless opposition of the Jesuits, which culminated in the complete subversion of their institution. Port Royal des Champs was finally suppressed by a bull of Pope Clement II (1709), and its property given to Port Royal de Paris. The latter continued its existence to the Revolution, when its house was converted into a prison, and subsequently (1814) into a maternity hospital.



Portrush (pōrt-rush′), a small seaport in the north of Ireland, 5 miles north of Coleraine; much resorted to for sea-bathing. It is connected with the Giant's Causeway by an electric tramway. Pop. 1196.

Port Said (pōrt-sä-ēd′), a town in Egypt, on the Mediterranean, at the northern entrance of the Suez Canal. It was begun simultaneously with the canal in 1859, being designed for its terminal port. There is an outer harbor formed by two piers jutting out into the sea, each terminated by a small lighthouse. This admits large ocean steamers, which thus sail into the inner harbor and from it into the canal. Near the entrance to the inner harbor is a lofty lighthouse with a powerful light. Pop. 54,400.

Portsea (pōrt′sē), an island of Hampshire, England, about 5 miles long (N. to S.) by about 3 broad. It comprises the towns of Portsmouth and Portsea, and several villages, and is connected with the mainland by a bridge at its north end. See *Portsmouth*.

Portsmouth (pōrts′muth), the principal station of the British navy, a seaport of England, in Hampshire, on the southwest extremity of the island of Portsea. It consists of the four districts, Portsmouth proper, Portsea, Landport, and Southsea. Portsmouth proper is a garrison town. The best street is the High Street, which contains the principal shops, hotels, and places of business. Portsea is the seat of the naval dockyard; Landport is an artisan quarter; and Southsea on the east side of the town of Portsmouth is a favorite seaside resort, and commands fine views of Spithead and the Isle of Wight. Southsea Castle with its adjacent earthworks, the batteries of the Gosport side, and the circular forts built out in the roadstead, command the entrance to Portsmouth Harbor. The island of Portsea, which is separated from the mainland by Portsbridge Canal, is bounded on the east by Langston Harbor, on the west by Portsmouth Harbor, and on the south by Spithead and the Harbor Channel. The royal dockyard covers an area of about 500 acres, and is considered the largest and most magnificent establishment of the kind in the world. Enclosed by a wall 14 feet high, and entered by a lofty gateway, it includes vast storehouses, containing all the materials requisite for naval architecture; machine shops, with all modern appliances; extensive slips and docks, in which the largest ships of the navy are built or repaired; ranges of handsome residences for the officials, and a Royal Naval College, with accommodation for seventy students. Outside the dockyard an area of 14 acres contains the gun-wharf, where vast numbers of guns and other ordnance stores are kept, and an armory with 25,000 stand of small arms. Portsmouth has no manufactures of any consequence, except those immediately connected with its naval es-

tablishments, and a few large breweries. Its trade, both coasting and foreign, is of considerable extent. Of late years an extensive and systematic series of fortifications has been under construction for the complete defense of Portsmouth. They extend along a curve of about 1½ miles at the north side of Portsea Island. A series of hills, 4 miles to the north of Portsmouth, and commanding its front to the sea, are well fortified with strong forts. On the Gosport side a line of forts extends for 4 miles. The municipal and parliamentary borough includes nearly the whole of the island of Portsea. Pop. (1911) 231,165.

Portsmouth, a seaport of Rockingham County, New Hampshire, on the right bank of the Piscataqua River, three miles from its mouth, and 58 miles N. by E. of Boston by water; first settled in 1624. The Government maintains at this port a navy yard with immense dry docks, and the harbor is one of the safest and most commodious in the United States, with a depth sufficient for the largest battleships. The North America, the first ship-of-line launched in the Western Hemisphere, was built in this harbor, and 'Ranger,' commanded by Captain John Paul Jones and 'Kearsarge' of Civil War fame, were built here. Shoes, buttons, etc. are manufactured. Portsmouth was the scene of the peace conference between the representatives of Russia and Japan in 1905. Pop. (1920) 13,569.

Portsmouth, a city, county seat of Scioto Co., Ohio, at the junction of Ohio and Scioto rivers, 107 miles E. S. E. of Cincinnati, on three railroads. It has 38 diversified industrial plants; annual payroll, $15,493,750. There are steel plants (5000 employees), shoe factories (4000 employees), stove and range factories, coke and brick works, furniture factories and railway terminals (3000 employees). It is the center of a famous corn belt. Pop. (1910) 23,481; (1920) 33,011; with new territory added since census, 38,214.

Portsmouth, a city, county seat of Norfolk Co., Virginia, on Elizabeth River, opposite Norfolk, the two cities being practically one. There is a fine harbor and large home and foreign commerce. Here is a U. S. navy yard, also the railroad shops of the Seaboard Air Line. It has paper, cotton and hosiery mills, shipyards, and many other industries, including important fisheries. Pop. (1910) 33,190; (1920) 54,387.

Port Stanley, port and capital of the Falkland Islands, on Port William Inlet, on the N. E. coast of East Falkland. It exports wool, hides, seal-fur, etc. Pop. 900.

Port Talbot. See *Aberavon.*

Portugal (pōr'tū-gal), a republic in the southwest of Europe, forming the west part of the Iberian Peninsula; bounded east and north by Spain, and west and south by the Atlantic; greatest length, north to south, 365 miles; greatest breadth, 130 miles. It is divided into eight provinces: Minho, Traz-os-Montes, Beira, Estremadura, Alemtejo, Algarve, Azores and Madeira, with a total area of 35,490 sq. miles, and a population of 5,500,000. The Azores and Madeira Islands are regarded as integral parts of the nation. The Portuguese are a mixed race—originally Iberian or Basque, with later Celtic admixture. Galician blood (derived from the ancient Gallaici, presumably Gallic invaders) predominates in the north; Jewish and Arabic blood are strongly present in the center, and African in the south. The principal Portuguese colonies are Goa, Macao, and Timor (part) in Asia; and Cape de Verde Is. Portuguese Guinea, the islands of Sao Thome and Principe, Angola, and Portuguese East Africa in Africa—the total area amounting to nearly 803,000 sq. m., and the total pop. to 15,000,000.

Physical Features.—Portugal is only partially separated from Spain by natural boundaries. Its shape is nearly that of a parallelogram. The coast-line, of great length in proportion to the extent of the whole surface, runs from the north in a general S. S. W. direction till it reaches Cape St. Vincent, where it suddenly turns east. It is occasionally bold, and rises to a great height; but far the greater part is low and marshy, and not infrequently lined by sands and reefs, which make the navigation dangerous. The only harbors of any importance, either from their excellence or the trade carried on at them, are those of Lisbon, Oporto, Setubal, Faro, Figueira, Aveiro, and Vianna. The interior is generally mountainous, a number of ranges stretching across the country, forming a succession of independent river basins, while their ramifications form the watersheds of numerous subsidiary streams, and enclose many beautiful valleys. The loftiest range is the Serra d'Estrella, a continuation of the central chain stretching across Spain, which attains the height of 7524 feet. The nucleus of the mountains is usually granite, especially in the north and middle. The minerals include lead, iron, copper, manganese, cobalt, bismuth, antimony, marble, slate, salt, saltpeter, lithographic stones, mill-

stones, and porcelain earth. No rivers of importance take their rise in Portugal. The Minho in the north, the Douro, and the Tagus all rise in Spain and flow from east to west. The Guadiana is the only large river which flows mainly south. Portugal can only claim as peculiarly her own the Vouga Mondego, and Sado.

Climate and Productions.— The climate is greatly modified by the proximity of the sea and the height of the mountains. In general the winter is short and mild, and in some places never completely interrupts the course of vegetation. Early in February vegetation is in full vigor; during the month of July the heat is often extreme, and the country assumes, particularly in its lower levels, a very parched appearance. The drought generally continues into September; then the rains begin, and a second spring unfolds. Winter begins at the end of November. In the mountainous districts the loftier summits obtain a covering of snow, which they retain for months; but south of the Douro, and at a moderate elevation, snow does not lie long. The mean annual temperature of Lisbon is about 56°. Few countries have a more varied flora than Portugal. The number of species has been estimated to exceed 4000, and of these more than 3000 are phanerogamous. Many of the mountains are clothed with forest trees, among which the common oak and the cork oak are conspicuous. In the central provinces chestnuts are prevalent; in the south both the date and the American aloe are found; while in the warmer districts the orange, lemon, and olive are cultivated with success. The mulberry affords food for the silkworm, and a good deal of excellent silk is produced. The vine, too, is cultivated, and large quantities of wine are sent to Britain (especially port wine), and also to France, being in the latter country converted into Bordeaux wine. Agriculture generally, however, is at a low ebb, and in ordinary years Portugal fails to raise cereals sufficient to meet its own consumption. Among domestic animals raised are mules of a superior breed, sheep, goats, and hogs; but up to a very few years ago little attention was paid to their improvement. In consequence of recent reforms, however, there has been a marked improvement in most branches of industry. More horned cattle have been raised and of a better quality, and live stock now figures with timber and wine among the chief exports. The fisheries, so long neglected, have also been revived in recent years.

Manufactures, Industry, etc.— Manufactures are of limited amount, although they have been increasing of late years. Portugal is not a manufacturing country; what industry there is is principally concentrated in the two chief towns, Lisbon and Oporto. In all, some 500,000 persons are engaged in industrial pursuits, and of these nearly 50,000 are employed weaving wool. The rest cut cork, manufacture cotton, linen, silk, leather, glass and porcelain, paper, and gold and silver filigree, and carry on various other industries. Besides wine, the principal general exports are cork, copper, ore, live cattle, sheep, horses, and pigs, wool, sardines, olive-oil, eggs, potatoes and onions. The total imports of Portugal in 1912 reached a total of $745,000,000; the exports in the same period being worth $345,000,000. The coast fisheries employ a large number of people, the sardine and tunny being the principal fish taken.

Government.—The government, now a republic, was until 1910 a monarchy, the crown hereditary both in the male and female line. The constitution recognized four powers in the state—the legislative, executive, judicial, and moderating, the last vested in the sovereign. There were two chambers, the Chamber of Peers and the Chamber of Deputies. The House of Deputies consisted of 149 members elected directly by all citizens above twenty-one years of age who possess certain qualifications of property or status. In external affairs the new government professes to remain faithful to traditional alliances and responsibilities. Under the constitution of 1911, there are two legislative chambers—a National Council and a Senate. The council is elected by direct suffrage for three years. The senate is elected by the municipal councils, half the members retiring every three years. The two chambers united constitute the Congress of the republic. The president of the republic is elected by both chambers for a period of four years. He cannot be re-elected.

History.— The Phœnicians, Carthaginians, and Greeks early traded to this part of the peninsula, the original inhabitants of which are spoken of as Lusitanians, the country being called Lusitania. It was afterwards conquered by the Romans, who introduced into it their own civilization. The country was afterwards inundated by Alans, Suevi, Goths, and Vandals, and in the eighth century (712) was conquered by the Saracens. When the Spaniards finally wrested the country between the Minho and the Douro from Moorish hands, they placed counts or governors over this region. Henry the Younger of Burgundy, grand-

son of Hugh Capet, came into Spain about 1090, to seek his fortune in the wars against the Moors. Alphonso VI gave him the hand of his daughter, and appointed him (1095) count and governor of the provinces Entre Douro e Minho, Traz-os-Montes, part of Beira, etc. The count, who owed feudal services to the Castilian kings, was permitted to hold in his own right whatever conquests he should make from the Moors beyond the Tagus (1112). Henry's son, Alphonso I, defeated Alphonso, king of Castile, in 1137, and made himself independent. In 1139 he gained the brilliant victory of Ourique over the Moors, and was saluted on the field as King of Portugal. The cortes convened by Alphonso in 1143 at Lamego confirmed him in the royal title, and in 1181 gave to the kingdom a code of laws and a constitution. Alphonso extended his dominions to the borders of Algarve, and took Santarem in 1143. The capture of Lisbon (1147) which was effected by the aid of some English Crusaders and others, was one of the most brilliant events of his warlike life. The succeeding reigns from Alphonso I to Dionysius (1279) are noteworthy chiefly for the conquest of Algarve (1251) and a conflict with the pope, who several times put the kingdom under interdict. Dionysius' wise encouragement of commerce, agriculture, manufactures, and navigation laid the foundation of the future greatness of Portugal. He liberally patronized learning, and founded a university at Lisbon, transferred in 1308 to Coimbra. By these and other acts of a wise and beneficent administration he earned the title of *father of his country.* He was succeeded by Alphonso IV, who in conjunction with Alphonso II of Castile defeated the Moors at Salado in 1340. He murdered Inez de Castro, the wife of his son Pedro (1355) (see *Inez de Castro*), who succeeded him. Dying in 1367, Pedro I was succeeded by Ferdinand, on whose death in 1383 the male line of the Burgundian princes became extinct. His daughter Beatrice, wife of the King of Castile, should have succeeded him; but the Portuguese were so averse to a connection with Castile that John I, natural son of Pedro, grand-master of the order of Avis (founded in 1162), was saluted king by the estates. In 1415 he took Ceuta, on the African coast, the first of a series of enterprises which resulted in those great expeditions of discovery on which the renown of Portugal rests. In this reign were founded the first Portuguese colonies, Porto Santo (1418), Madeira (1420), the Azores (1433), and those on the Gold Coast. The reigns of his son Edward (1433-38) and his grandson Alphonso V were less brilliant than that of John I; but the latter was surpassed by that of John II (1481-95), perhaps the ablest of Portugal's rulers. In his reign began a violent struggle with the nobility, whose power had become very great under his indulgent predecessors. The expeditions of discovery were continued with ardor and scientific method. Bartolommeo Diaz doubled the Cape of Good Hope in 1487, and Vasco da Gama reached India in 1498. In 1500 Cabral took possession of Brazil. (See *Colony.*) While these great events were still in progress John II was succeeded by his cousin Emanuel (1495-1521). The conquests of Albuquerque and Almeida made him master of numerous possessions in the islands and mainland of India, and in 1518 Lope de Soares opened a commerce with China. Emanuel ruled from Bab el Mandeb to the Straits of Malacca, and the power of Portugal had now reached its height. In the reign of John III, son of Emanuel (1521-57), Indian discoveries and commerce were still further extended; but the rapid accumulation of wealth through the importation of the precious metals, and the monopoly of the commerce between Europe and India, proved disadvantageous to home industry. The wisdom which had hitherto so largely guided the counsels of the kings of Portugal now seemed to forsake them. The Inquisition was introduced (1536), and the Jesuits were admitted (1540). Sebastian, the grandson of John III, who had introduced the Jesuits, having had his mind inflamed by them against the Moors of Africa, lost his life in the battle against these infidels (1578), and left his throne to the disputes of rival candidates, of whom the most powerful, Philip II of Spain, obtained possession of the kingdom by the victory of Alcantara. The Spanish yoke was grievous to the Portuguese, and many efforts were made to break it; but the power of Philip was too great to be shaken. Portugal continued under the dominion of Spain till 1640, and her vast colonial possessions were united to the already splendid acquisitions of her rival. But these now began to fall into the hands of the Dutch, who, being provoked by hostile measures of Philip, attacked the Portuguese as well as the Spanish possessions both in India and America. They deprived the Portuguese of the Moluccas, of their settlements in Guinea, of Malacca, and of Ceylon. They also acquired about half of Brazil, which, after the reës-

tablishment of Portuguese independence, they restored for a pecuniary compensation. In 1640, by a successful revolt of the nobles, Portugal recovered her independence, and John IV, Duke of Braganza, reigned till 1656, when he was succeeded by Alphonso VI. Alphonso ceded Tangier and Bombay to England as the dowry of his daughter, who became the queen of Charles II. Pedro II, who deposed Alphonso VI, concluded a treaty with Spain (1668), by which the independence of the country was acknowledged. During the long reign of John V (1706-50) some vigor was exerted in regard to foreign relations, while under his son and successor Joseph I (1750-77) the Marquis of Pombal, a vigorous reformer such as Portugal required, administered the government. On the accession of Maria Francisca Isabella, eldest daughter of Joseph, in 1777, the power was in the hands of an ignorant nobility and a not less ignorant clergy. In 1792, on account of the sickness of the queen, Juan Maria José, Prince of Brazil (the title of the prince-royal until 1816), was declared regent. His connections with England involved him in war with Napoleon; Portugal was occupied by a French force under Junot, and the royal family fled to Brazil. In 1808 a British force was landed under Wellington, and after some hard fighting the decisive battle of Vimeira took place (August 21), which was followed by the Convention of Cintra and the evacuation of the country by the French. The French soon returned, however; but the operations of Wellington, and in particular the strength of his position within the lines of Torres Vedras, forced them to retire. The Portuguese now took an active part in the war for Spanish independence. On the death of Maria, in 1816, John VI ascended the throne of Portugal and Brazil, in which latter country he still continued to reside. The absence of the court was viewed with dislike by the nation, and the general feeling required some fundamental changes in the government. A revolution in favor of constitutional government was effected without bloodshed in 1820, and the king invited to return home, which he now did. In 1822 Brazil threw off the yoke of Portugal, and proclaimed Dom Pedro, son of John VI, emperor. John VI died in 1826, having named the Infanta Isabella Maria regent. She governed in the name of the Emperor of Brazil, Dom Pedro IV of Portugal, who granted a new constitution, modeled on the French, in 1826. In this year he abdicated the Portuguese throne in favor of his daughter Maria da Gloria, imposing on her the condition of marrying her uncle Dom Miguel, who was entrusted with the government as regent; but the absolutist party in Portugal set up the claim of Dom Miguel to an unlimited sovereignty, and a revolution in his favor placed him on the throne in 1828. In 1831 Dom Pedro resigned the Brazilian crown, and returning to Europe succeeded in overthrowing Dom Miguel, and restoring the crown to Maria in 1833, dying himself in 1834. In 1836 a successful revolution took place in favor of the restoration of the constitution of 1820, and in 1842 another in favor of that of 1826. Maria died in 1853. Her husband, Ferdinand of Saxe-Coburg (Dom Ferdinand II), became regent for his and her son, Pedro V, who himself took the reins of government in 1855. Pedro died in 1861, and was succeeded by his brother, Louis I. Louis died in 1889, and was succeeded by his son, Carlos I. During these latter reigns the state of Portugal was generally fairly prosperous and progressive. King Carlos was assassinated by revolutionists Feb. 1, 1908, with his oldest son, the second son, born 1889, ascending the throne under title of Manuel II. In the recent division of Africa between the nations Portugal lost part of her territory in that continent.

The dissatisfaction of the people with the methods pursued by the government, which was manifested in the assassination of Carlos I, grew still more marked under his injudicious youthful successor and the corrupt and expensive administration of the departmental officials, and on October 3, 1910, a sudden revolutionary movement broke out in the streets of Lisbon. Socialistic and republican sentiment had invaded the army, many of the troops joining the revolutionists, and the outbreak made such rapid and successful progress that by the 5th Manuel had fled the kingdom and a republic was proclaimed, under the presidency of Theophile Braga, a poet and historian. Dr. Bernardino Machado was elected president August 6, 1915.

When the European war broke out in 1914 the government declared that Portugal would stand by her old treaty of alliance with England and the forces of the Portuguese colonies were strengthened and co-operated against German West African territory. An attempt to restore the monarchy was made in 1915, but was unsuccessful. In February, 1916, Portugal seized a number of German vessels; and Germany, denouncing the act as a violation of treaty obligations, declared

war on Portugal March 9. Portuguese troops were used on the western front as well as in Africa. See *European War.*

Language and Literature.— The differences between Portuguese and Spanish languages are of comparatively modern origin, the two languages being very nearly alike in the time of Alphonso I. The dialect of Spanish spoken in Portugal at the beginning of the monarchy was the Galician, which was also that of the court of Leon; but that court subsequently adopted the Castilian, which beame the dominant language of Spain. The decline of the Galician dialect in Spain and the formation of the Portuguese language finally determined the separation of Spanish and Portuguese, and from cognate dialects made them distinct languages. Portuguese is considered to have less dignity than the Spanish, but is superior to it in flexibility. In some points of pronunciation it more resembles French than Spanish. It is also the language of Brazil. The oldest monuments of Portuguese literature do not go back further than the twelfth and thirteenth centuries, and the native literature could then boast of nothing more than popular songs. The first Portuguese collection of poetry (*cancioneiro*) was made by King Dionysius, and was published under the title of *Cancioneiro del Rey Dom Diniz.* Some poems on the death of his wife are attributed to Pedro I, husband of Inez de Castro. The sons and grandsons of John I were poets and patrons of the troubadours. Sà de Miranda marks the transition from the fifteenth to the sixteenth century and the separation of the Portuguese from the other Spanish dialects and from the language of the troubadours. The sixteenth century is the classic era of Portuguese literature. The chief names are Sà de Miranda, Antonio Ferreira, Camoens, Diego Bernardes, Andrade Caminha, and Alvares do Oriente. The principal epic and the greatest poem in the Portuguese literature, almost the only one which has acquired a European reputation, is *Os Lusiadas* (The Portuguese) of Camoens (1524-80), which has placed its writer in the rank of the few great poets of the highest class whose genius is universally recognized. After Camoens as an epic writer comes Cortereal, who has celebrated the siege of Diù and the shipwreck of Sepulveda. Vasco de Lobeiro, Francisco Moraes, and Bernardim Ribeiro are among the leading romance writers. The drama also began to be cultivated in the sixteenth century. Sà de Miranda studied and imitated Plautus. Ferreira composed the first regular tragedy, *Inez de Castro.* Camoens wrote several theatrical pieces, among which are *Amphitryon and Seleucus.* Barros, also a romance writer, wrote a *History of the Conquest of India.* The *Commentaries* of Alphonso d'Albuquerque, by a nephew of the conqueror; the *Chronicle of King Manuel and of Prince John,* by Damian de Goes; the *History of the Discovery and Conquest of the Indies,* by Lopès de Castanheda; *the Chronicle of King Sebastian,* by Diego Bernardo Cruz, are all works of merit. By the opening of the seventeenth century Portugal's literary greatness had been succeeded by one of great activity, though of little real power. A crowd of epics were stimulated into being by the success of the *Lusiad.* During this period the native drama became almost extinct, being overshadowed by the Spanish. In the eighteenth century the influence of the French writers of the age of Louis XIV so completely dominated Portuguese literature that it became almost entirely imitative. Towards the close of this century two writers appeared who have formed schools, Francisco Manoel do Nascimento (1734-1829), an elegant lyrist, and Barbosa du Bocage, who introduced an affected and hyperbolical style of writing. Among more recent poets possessing some claim to originality may be mentioned Mouzinho de Albuquerque, Feliciano Castilho, Herculano de Carvalho, Almeida Garrett, Thomaz Ribeiro and Theophile Braga; among novelists are Carvalho, Garrett, Julio Diniz, and Rebello de Silva. Among historians Braga stands first. Through the efforts of these and others Portuguese literature has again begun to assume an aspect of native vigor. In art Portugal has never distinguished herself.

Portuguese East Africa, a colony of Portugal, on the E. coast of Africa, is bounded N. by Tanganyika Territory, W. by British Central Africa, Lake Nyassa, Rhodesia and the Transvaal, and S. by Natal. In 1919 Portugal was awarded a portion of late German East Africa. Total area, 428,132 sq. miles. Lourenco Marquez is the capital. Other ports are Mozambique. Ibo, Chinde, and Beira. Pop. about 3,000,000.

Portuguese Guinea, a colony of Portugal on the coast of Senegambia, W. Africa. It includes the Bissagos Is. off the coast. It produces rubber, wax, ivory, hides, rice, palm oil, etc. Its capital is Bulama on the island of same name, with a pop. of about 300,000.

Portuguese India, consists of three colonies on the W. coast. (1) Goa, 250 m. S. S. E. of Bombay. Area, 1469 sq. m. (2) Damao, 100 m. N. of Bombay. Area, 169 sq. m. (3) The small isl. of Diu, 120 m. W. of Damao. Area, 2 sq. m. Total pop. 605,000.

Portulaceæ (por-tu-la'ca), a small nat. order of polypetalous exogens, consisting of annual, perennial, herbaceous, or shrubby plants. The only species of any importance is *Portulăca oleracĕa*, or common purslane, which is a fleshy, prostrate annual.

Port Wine, is a very strong, full-flavored wine produced in the upper valley of the Douro, Portugal, and has its name from the place of shipment, Oporto. It is slightly astringent, and has a color varying from pink to red. It requires three or four years to mature, and with age becomes tawny; it receives a certain proportion of spirit to hasten the process of preparation. Large quantities of artificial port are made, particularly in the United States.

Poseidōn (po-sī'dōn), the Greek god of the sea, identified by the Romans with the Italian deity Neptunus. A son of Kronos and Rhea, and hence a brother of Zeus, Hēra, and Dēmētēr, he was regarded as only inferior in power to Zeus. His usual residence was in the depths of the sea near Ægæ, in Eubœa, and the attributes ascribed and most of the myths regarding him have reference to the phenomena of the sea. The horse, and more particularly the war-horse, was sacred to Poseidōn, and one of the symbols of his power. During the Trojan war Poseidōn was the constant enemy of Troy, and after its close he is described as thwarting the return of Ulysses to his home for his having killed Polyphēmus, a son of the god. Poseidōn was married to Amphitritē. His worship was common throughout Greece and the Greek colonies, but especially prevailed in the maritime towns. The Isthmian games were held in his honor. In works of art Poseidōn is represented with features resembling those of Zeus, and often bears the trident in his right hand. A common representation of him is as drawn in his chariot over the surface of the sea by hippocamps (monsters like horses in front and fishes behind) or other fabulous animals.

Posen (pō'zen), a town of Poland, formerly in Prussia, capital of the province of the same name, situated on the Warthe, 149 miles east by south of Berlin. It is surrounded by two lines of forts, is built with considerable regularity, has generally fine wide streets, and numerous squares or open spaces. The most noteworthy public buildings are the cathedral, in the Gothic style (1775), the town parish church, a fine building in the Italian style, both Roman Catholic; the town-house (1508), with a lofty tower; the Raczynski Library; the municipal archive building, etc. The manufactures consist chiefly of agricultural machines, manures, woolen and linen tissues, carriages, leather, lacquerware, etc. There are also breweries and distilleries. Pop. 156,691.—The province is bounded by West Prussia, Russian Poland, Silesia, and Brandenburg; area, 11,178 sq. miles. The surface is flat, and extensively occupied by lakes and marshes. A small portion on the northeast belongs to the basin of the Vistula; all the rest to the basin of the Oder. The soil is mostly of a light and sandy character, yielding grain, millet, flax, hemp, tobacco, and hops. Forests occupy 20 per cent. of the surface. The inhabitants include many Germans, especially in the towns, but considerably more than half are Poles, Posen being one of the acquisitions which Prussia made by the dismemberment of Poland. By the peace of 1919 (see *Treaty*), it became part of Poland. Pop. 1,888,055.

Posidonius (pos-i-dō'ni-us), a Stoic philosopher, born in Syria, about 135 B.C. He settled as a teacher at Rhodes, whence he is called the Rhodian. The most distinguished Romans were his scholars, and Cicero was initiated by him into the Stoic philosophy. Removing to Rome in 51 B.C., he died not long after. In his physical investigations he was more a follower of Aristotle than of the Stoic school.

Posilipo (po-zē'lip-po), an eminence which bounds the city of Naples on the west. It is traversed by a tunnel called the Grotto of Posilipo, 2244 feet long, from 21 to 32 feet wide, with a height varying from 25 to 69 feet, through which runs the road to Pozzuoli. This tunnel is remarkable for its antiquity, being constructed in the reign of Augustus. A second tunnel has recently been constructed for the tramway from Naples to Pozzuoli.

Positive (poz'i-tiv), in photography, a picture obtained by printing from a *negative*, in which the lights and shades are rendered as they are in nature. See *Photography*.

Positive Philosophy, or POSITIVISM, is the name given by Auguste Comte to the philosophical and religious system promulgated by him (chiefly in his *Cours*

de Philosophie Positive, 1830–42, and his posthumous *Essays on Religion*). The distinguishing idea which lies at the root of this twofold system is the conception that the anomalies of our social system cannot be reformed until the theories upon which it is shaped have been brought into complete harmony with science. The leading ideas of Comte's philosophy are (1) the classification of the sciences in the order of their development, proceeding from the simpler to the more complex — mathematics, astronomy, physics, chemistry, biology and sociology; and (2) the doctrine of the 'three stages,' or the three aspects in which the human mind successively views the world of phenomena, namely, the theological, the metaphysical, and the scientific. This theory of the three stages, one of the most characteristic of Comte's system, is thus succinctly stated by George Henry Lewes:

'Every branch of knowledge passes successively through three stages. 1st, the *supernatural* or fictitious; 2d, the *metaphysical* or abstract; 3d, the *positive* or scientific. The first is the necessary point of departure taken by human intelligence; the second is merely a stage of transition from the supernatural to the positive; and the third is the fixed and definite condition in which knowledge is alone capable of progressive development. In the *supernatural* stage the mind seeks after *causes;* aspires to know the *essences* of things and their modes of operation. It regards all effects as the productions of supernatural agents, whose intervention is the *cause* of all the apparent anomalies and irregularities. Nature is animated by superhuman beings. Every unusual phenomenon is a sign of the pleasure or displeasure of some being adored and propitiated as a God. In the metaphysical stage, which is only a modification of the former, but which is important as a transitional stage, the supernatural agents give place to abstract forces (personified abstractions) supposed to inhere in the various substances, and capable themselves of engendering phenomena. The highest condition of this stage is when all these forces are brought under one general force named nature. In the positive stage the mind, convinced of the futility of all inquiry into causes and essences, applies itself to the observation and classification of laws which regulate effects; that is to say, the invariable relations of succession and similitude which all things bear to each other. The highest condition of this stage would be to be able to represent all phenomena as the various particulars of one general view.'

The religious side of positivism has somewhat the nature of an apology or afterthought. After doing away with theology and metaphysics, and reposing his system on science or positive knowledge alone, Comte discovered that there was something positive in man's craving for a being to worship. He therefore had recourse to what he calls the cultus of humanity considered as a corporate being in the past, present, and future, which is spoken of as the *Grand Etre*. This religion, like other forms of worship, requires for its full development an organized priesthood, temples, etc. Under the régime of positive religion Comte would include the political and social side of his system. Hence some of his followers look forward to the establishment of an international republic, composed of the five great western nations of Europe, destined ultimately to lead the whole world. Society in this great commonwealth will be reorganized on the basis of a double direction or control, that of the temporal or material authority, and that of the spiritual or educating body.

Among leading thinkers of the last generation Comte's philosophy found many admirers and some adherents, partly, doubtless, on account of its striking originality, partly by reason of the author's powerful personality. They included such intellects as George Henry Lewes, John Stuart Mill, Richard Congreve, Harriet Martineau, and others. Later investigators, however, have not sustained the favorable verdict of those who judged from a nearer mental perspective. The critiques of Herbert Spencer, Professor Huxley, John Fiske, and Dr. McCosh are specially important; also the reply of M. Littré, the foremost French disciple of Comte, to Mill's elaborate critique of positivism. Though there is still a faithful following of the positive philosophy, it is not so distinguished as formerly; while the professed disciples of the religion of humanity are few and rare.

Posse Comitatus (pos'e com-i-tā'-tus), in law, 'the power of the county,' that is, the citizens who are summoned to assist an officer in suppressing a riot or executing any legal process.

Postal Savings Banks. The system of postal savings banks, adopted for the United States by Act of Congress in 1910, has long been in existence, with very satisfactory results, in many foreign countries. The deposits in 1908 in Great

Britain were $781,794,533; in Italy, $285,442,694; in France, $276,655,969; in Belgium, $134,040,979; and in Russia, $128,873,169. They extend to many other countries, with deposits under $100,000,000. The total for the world aggregated $1,989,299,815, the depositors numbering 40,320,303. Comparison showed that in ten years the number of depositors have doubled and that deposits had increased 75 per cent. Under the new law in the United States an experimental bank was opened in each State on January 1, 1911. The response has been so satisfactory that many others have been added. Any sum from $1 to $100 is accepted, and interest paid at the rate of 2 per cent.

Postern (pos'tern), in fortification, is a small gate usually in the angle of the flank of a bastion, or in that of the curtain, or near the orillon, descending into the ditch.

Post-glacial. See *Post-tertiary.*

Posting (pōst'ing), traveling by means of horses hired at different stations on the line of journey, a system established in England as early as the reign of Edward II.

Postmaster-General, the chief officer of the Postoffice Department of the executive branch of the government of the United States. His duties are to establish postoffices and appoint postmasters, and, generally, to superintend the business of the department in all the duties assigned to it.

Post-mill, a form of windmill so constructed that the whole fabric rests on a vertical axis, and can be turned by means of a lever. See *Windmill.*

Post-obit Bond, a bond given for the purpose of securing to a lender a sum of money on the death of some specified individual from whom the borrower has expectations. Such loans are not only generally made at usurious rates of interest, but usually the borrower has to pay a much larger sum than he has received in consideration of the risks the lender runs in the case of the obliger predeceasing the person from whom he has expectation. If, however, there is a gross inadequacy in the proportions amounting to fraud, a court of equity will interfere.

Postoffice, a department of the government of a country charged with the conveyance of letters, newspapers, parcels, etc., and also since recent times with the transmission of telegrams. From the time of Cyrus the Elder down to the middle ages various rulers had concocted more or less effective systems of postal communication throughout their dominions; but the 'post' as we know it to-day is an institution of very modern growth. The first traces of a postal system in England are observed in the statutes of Edward III, and the postoffice as a department of government took its rise in the employment of royal messengers for carrying letters. The first English postmaster we hear of was Sir Brian Tuke, his date being 1533. In 1543 a post existed by which letters were carried from London to Edinburgh within four days, but this rate of transportation, rapid for that period, lasted but a short time. James I improved the postal communication with Scotland, and set on foot a system for forwarding letters intended for foreign lands. In 1607 he appointed Lord Stanhope postmaster for England, and in 1619 a separate postmaster for foreign parts. Up to within a short time of the reign of Charles I, merchants, tradesmen, and professional men availed themselves of any means of conveyance that offered, or employed express messengers to carry their correspondence. The universities and principal cities had their own posts. The foreign merchants settled in London continued to send their foreign letters by private means long after the establishment of the foreign post. In 1632 Charles I forbade letters to be sent out of the kingdom except through the postoffice. In 1635 he established a new system of posts for England and Scotland. All private and local posts were abolished, and the income of the postoffices was claimed by the king. Interrupted by the civil wars, peace had no sooner been restored than a more perfect postal system was established. In 1683 a penny post was set up in the metropolis. During the government of William III acts of parliament were passed which regulated the internal postal system of Scotland; and under Queen Anne, in 1711, the postal system of England was arranged on the method on which, with some modifications, it continued till near the middle of the nineteenth century. Sir Rowland Hill, the author of the system at present existing, gave the first intimation of his plan in a pamphlet in the year 1837. He soon had the satisfaction of seeing the legislature adopt his plan, in its principal features at least, and on the 10th January, 1840, the uniform rate of 1*d.* per ½ oz. for prepaid letters came into operation. The success of Rowland Hill's scheme was vastly favored by the invention of the adhesive postage stamp, the

idea of which would seem to be due to Mr. James Chalmers, of Dundee. Subsequently many important improvements have been made in the management of the postoffice business. One of these was the adoption of postal carriages on railways, by which the delivery of letters was greatly accelerated. These carriages are fitted with an apparatus into which letter-bags are thrown without stopping or even materially slackening the speed of the train; while the sorting of letters, etc., proceeds during the transit. The reduction of the cost of carriage, the great increase in the rapidity of transmission, the immense development of commerce, together with the increase of population, have had the effect of enormously increasing the work done by the postoffice. In recent years an immense stride has been taken in the improvement of postal communication between different countries by the formation of the International Postal Union in 1885. All the states of the Union form a single postal territory, having a uniform charge for the letters, etc., passing between the several states of which it is composed.

In France a system of postal messengers for administrative purposes was established under Louis XI in 1464, and it is to France that the term *post* is due. A general postal system in France was set on foot in 1576. Up to near the end of the eighteenth century the French posts were farmed out. The postal reform introduced into England by Sir Rowland Hill was to some extent adopted in France in 1849, but it is only recently that the French postal arrangements have been rendered satisfactory. In Germany the first post was established in Tyrol about the latter half of the fifteenth century by the Count of Thurn, Taxis, and Valsassina, and the administration of the postal system of the empire, with the revenues attached, remained until 1803 as a fief to this family. Many of the German states, however, had also a separate post of their own. The connection of the telegraphic with the postal system of Germany began in 1849. Since the establishment of the German Empire a uniform postal and telegraphic system has been organized for the whole of Germany. The Germans have paid great attention to their postal arrangements, and in some respects they are ahead of other countries. To Germany is due the introduction of post-cards, which were first proposed by Prussia at a postal conference held at Karlsruhe in 1865. The postal system of Italy arose in Piedmont about the year 1560, when the Duke of Savoy farmed out the transmission of letters to a postmaster-general. This arrangement continued until 1697, when Duke Victor Amadeus added the income of the postoffice to the revenue of the state, and from 1710 the administration was carried on directly by the state. Since the unification of Italy a reorganized system, including telegraphic and parcel transmissions, has been extended to the whole of the kingdom. In most of the other states of Europe a very perfect system also now obtains. The development of a postal system in the American colonies followed in the lines of that already established in Britain. The earliest mention of a postoffice in the colonies is in 1639, a postoffice for foreign letters being then established at Boston. In 1683 a postoffice was established in Pennsylvania by William Penn. In 1692 a postmaster-general for the American colonies was appointed, and a general postal system was soon after organized. Benjamin Franklin was postmaster-general in 1753-74, and numerous reforms were instituted under his management. In 1760 he arranged a stage-wagon to convey the mail from Philadelphia to Boston once a week, starting from each city on Monday morning and reaching its destination by Saturday night. In 1789 the Constitution conferred upon Congress the exclusive control of postal matters in the states. In 1790 there were but 75 postoffices in the country, and the whole sum received for postage was $37,935. At the close of the Civil war, in 1865, there were 20,000 postoffices, 140,000 miles of post route, and receipts of $14,500,000. In 1910 there were over 60,000 postoffices, 450,000 miles of postal routes, and a revenue of about $225,000,000. The number of pieces of all kinds which passed through the mails was over 14,000,000,000. The annual aggregate of letters for all the postoffices of the world is estimated at 30,000,000,000 and of newspapers at 15,000,000,000. The early post rates in this country were based more on the distance carried than the weight of the letter. Until 1816 the rate for a single letter (composed of a single piece) was, under 40 miles, 8 cents; under 90, 10 cents; under 150, 12½ cents; under 300, 17 cents; under 500, 20 cents; over 500, 25 cents. Some modifications were made in 1816, and in 1845 new rates were fixed, as follows: for a letter not over half an ounce in weight under 300 miles, 5 cents; over 300, 10 cents; and an additional rate for every extra half ounce or fraction thereof. In 1853 the rates were reduced to 3 cents for all

distances under 3000 miles, and 10 cents for all over that distance. In 1863 the rate was fixed at 3 cents for all letters within the United States of not more than half an ounce weight. The 1-cent postal card was adopted in 1873, and the 2-cent letter rate in 1883, the weight being increased in 1885 from a half ounce to an ounce. Rural free delivery has since been adopted, also delivery of merchandise parcels. In 1909 the 2-cent postal rate for letters was extended to letters for Great Britain and Germany, in the latter case carriage in German mail ships being required. Also to Canada, Mexico, Cuba, Panama, and Shanghai.

In the United States, under present regulations, all mail matter is divided into four classes. The first class includes letters, post-cards, and anything closed against inspection: postage, 2 cents each oz. or additional fraction of an oz.; post-cards, 1 cent; registered letters, 10 cents in addition to postage. Second class matter includes all newspapers, periodicals, etc., issued as frequently as four times a year; postage, 1 cent per lb. or fraction thereof. When the newspapers, etc., are sent by persons other than the publishers the charge is 1 cent for each four ounces. Mail matter of the third class includes photographs, circulars, proof-sheets, etc.; postage, 1 cent for each 2 ozs.; limit of weight, 4 lbs. each package. The fourth class, or Parcel Post, embraces merchandise and all matter not included in the other three classes: postage varying according to weight and distance. Prepayment of postage by stamps for all classes of matter is required.

A brief synopsis of offenses against the postal laws follows: No article may be mailed intended or adapted for any indecent or immoral use, or printed matter describing where such may be procured; also any letter or circular concerning any kind of lotteries, or any scheme for defrauding the public. It is unlawful, also, to send any threatening, inflammatory or libelous matter; thus dunning notices may not be sent on postal cards. The use of the mail to offer for sale any spurious or counterfeit note or money is a crime punishable by fine, imprisonment, or both. It is forbidden to open the letters, though unsealed, of other persons. To knowingly and willfully obstruct the mail renders liable to a fine of $100.

Post-pleiocene (pōst-plī'o-sēn), or POST-PLIOCENE, in geology, same as *Pleistocene.*

Post-tertiary (pōst-tėr'shå-ri), in geology, the Lyellian term for all deposits and phenomena of more recent date than the Norwich or mammaliferous crag. It may be restricted so as only to include accumulations and deposits formed since the close of the glacial or boulder drift systems and has been divided into three sections — *historic*, *prehistoric*, and *post-glacial* The first comprises the peat of Great Britain and Ireland, fens, marshes, river deposits, lake silts, accumulations of sand drift, etc., containing human remains, canoes, metal instruments, remains of domestic animals, etc. The *prehistoric* comprises similar or nearly similar deposits, but the remains found in them are older, comprising stone implements, pile-dwellings, and extinct animals, as the Irish deer, mammoth, etc. To the *post-glacial* belong raised beaches, with shells of a more boreal character than those of existing seas, the shell-marl under peat, many dales and river valleys, as well as the common brick-clay, etc., covering submarine forests or containing the remains of seals, whales, the mammoth, rhinoceros, urus, hyæna, hippopotamus, etc.

Postulate (pos'tū-lāt), a position or supposition assumed without proof, being considered as self-evident, or too plain to require illustration. In geometry, the enunciation of a self-evident problem. Euclid has constructed his elements on the three following postulates: 1. Let it be granted that a straight line may be drawn from any one point to any other point. 2. That a terminated straight line may be produced to any length in a straight line. 3. That a circle may be described from any center at any distance from that center.

Potamogeton (pot-a-moj'e-ton), a genus of aquatic plants belonging to the nat. order Naiadaceæ. It has a perfect flower, a four-pointed perianth, four sessile anthers, four ovaries, and four drupes or nuts. Several species are indigenous to Britain, where they are known by the name of *pond-weed.*

Potash (pot'ash), or POTASSA, an alkaline substance obtained from the ley of vegetable ashes which is mixed with quicklime and boiled down in iron pots, and the residuum ignited, the substance remaining after ignition being common potash. It derives its name from the *ashes* and the *pots* (called potash kettles) in which the lixivium is (or used to be) boiled down. An old name was *vegetable alkali.* Potash in this crude state is an impure carbonate of potassium, which when purified is known in commerce as *pearl-ash.* It is used in the making of glass and soap, and large quantities of it are now produced from certain 'potash minerals' (especially carnallite), instead

of from wood ashes. What is known as *caustic potash* (hydrate of potassium, KHO) is prepared from ordinary potash. It is solid, white, and extremely caustic, *cating* into animal and vegetable tissues with great readiness. It changes the purple of violets to green, restores reddened litmus to blue, and yellow turmeric to reddish brown. It rapidly attracts humidity from the air, and becomes semi-fluid. It is fusible at a heat of 300°, and is volatilized at low ignition. It is used in surgery under the name of *lapis infernālis* or *lapis causticus* for destroying warts, fungoid growths, etc., and may be applied beneficially to the bites of dogs, venomous serpents, etc. In chemistry it is very extensively employed, both in manufactures and as an agent in analysis. It is the basis of the common soft soaps, for which purpose, however, it is not used in its pure state. See *Potassium*.

Potash Water, an aerated water produced by mixing bicarbonate of potash with carbonic acid water in the proportion of 20 grains to each bottle of the water, or about half an ounce to the gallon. Bisulphate of potash, as being cheaper than tartaric acid, is sometimes used (but should not be) with carbonate of soda to produce the common effervescing drink. A valuable medicinal water is compounded of a certain proportion of bromide of potassium. See *Aerated Waters*.

Potassium (po-tas'i-um; a Latinized term from *potash*), a name given to the metallic basis of potash, discovered by Davy in 1807, and one of the first fruits of his electro-chemical researches; symbol, K; atomic weight, 39.1. Next to lithium it is the lightest metallic substance known, its specific gravity being 0.865 at the temperature of 60°. At ordinary temperatures it may be cut with a knife and worked with the fingers. At 32° it is hard and brittle, with a crystalline texture; at 50° it becomes malleable, and in luster resembles polished silver; at 150° it is perfectly liquid. Potassium has a very powerful affinity for oxygen, which it takes from many other compounds. A freshly exposed surface of potassium instantly becomes covered with a film of oxide. The metal must therefore be preserved under a liquid free from oxygen, rock-oil or naphtha being generally employed. It conducts electricity like the common metals. When thrown upon water it decomposes that liquid with evolution of hydrogen, which burns with a pale violet flame, owing to the presence in it of potash vapor. *Chloride* of potassium (KCl) is known in commerce as 'muriate of potash,' and closely resembles common salt (chloride of sodium). It is obtained from potassic minerals, the ashes of marine plants (kelp), and from sea-water or brine springs. It enters into the manufacture of saltpeter, alum, artificial manures, etc. *Bromide* and *iodide* of potassium are useful drugs. (For the *carbonate* of potassium see *Potash*.) *Bicarbonate* of potassium is obtained by exposing a solution of the carbonate to the air, carbonic acid being imbibed from the atmosphere, and crystals being deposited; or it is formed more directly by passing a current of carbonic acid gas through a solution of the carbonate of such a strength that crystals form spontaneously. It is much used in medicine for making effervescing drinks. *Nitrate* of potassium is *niter*, or *saltpeter*. (See *Niter*.) *Sulphate* of potassium (K_2SO_4) is used medicinally as a mild laxative, in making some kinds of glass and alum, and in manures. The *bisulphate* ($KHSO_4$) is used as a chemical reagent, and in calico-printing and dyeing. *Chlorate* of potassium ($KClO_3$) is employed in the manufacture of lucifer matches, in certain operations in calico-printing, and for filling friction-tubes for firing cannon. It is a well-known source of oxygen. The *bichromate* ($K_2Cr_2O_7$) is also used in calico-printing and dyeing. *Cyanide* of potassium (KCN_7) is much used in photography.

Potato (pō-tā'tō; *Solānum tuberōsum*), a plant belonging to the nat. order Solanaceæ, which also includes such poisonous plants as nightshade, henbane, thorn-apple and tobacco. We owe

Tubers of Potato.

this esculent to western South America, where it still grows wild, chiefly in the region of the Andes, producing small,

tasteless, watery tubers. The potato was first introduced into Europe by the Spaniards after the conquest of Peru, by whom it was spread over the Netherlands, Burgundy, and Italy before the middle of the sixteenth century. In Germany it is first heard of as a rarity in the time of Charles V. Sir John Hawkins, Sir Francis Drake, and Sir Walter Raleigh are all credited with the first introduction of the tuber into England (1565). Although the potato was tolerably widely distributed on the continent of Europe before its appearance in Britain, it seems to have been cultivated more as a curiosity than as an article of food, and Ireland is said to have been the country in which it was first cultivated on a large scale for food. In the course of the eighteenth century it became a favorite article of food with the poorer classes in Germany; but in France there existed so violent a prejudice against it that it did not come into general use until towards the end of the century. The potato is a perennial plant, with angular, herbaceous stems, growing to the height of 2 or 3 feet; leaves pinnate; flowers pretty large, numerous, disposed in corymbs, and colored violet, bluish, reddish, or whitish. The fruit is globular, about the size of a gooseberry, reddish brown or purplish when ripe, and contains numerous small seeds. The tubers, which furnish so large an amount of the food of mankind, are really underground shoots abnormally dilated, their increase in size having been greatly fostered by cultivation. Their true nature is proved by the existence of the 'eyes' upon them. These are leaf-buds, from which, if a tuber or a portion of it containing an eye is put into earth, a young plant will sprout, the starchy matter of the tuber itself supplying nutriment until it throws out roots and leaves, and so attains an independent existence. The potato succeeds best in a light, sandy loam containing a certain proportion of vegetable matter. The varieties are very numerous, differing in the time of ripening, in their form, size, color, and quality. New ones are readily procured by sowing the seeds, which will produce tubers the third year, and a full crop the fourth. But the plant is usually propagated by sowing or planting the tubers, and it is only in this way that any one variety can be kept in cultivation. Like all plants that are extensively cultivated, and under very different circumstances of soil, climate, and artificial treatment, the potato is extremely subject to disease. Among the diseases to which it is liable are the 'curl,' the 'scab,' the 'dry rot,' and the 'wet rot,' besides the more destructive potato disease proper. The principal feature of the curl is the curling of the shoots soon after their first appearance. After that they make little progress, and sometimes disappear altogether. The plants produce no tubers, or only a few minute ones, which are unfit for food. The scab is a disease that attacks the tubers, which become covered with brown spots on the outside, while underneath the skin is a fungus called *Tubercinia scabies*. The dry rot is characterized by a hardening of the tissues, which are completely gorged with mycelium (the vegetative part of fungi). In the disease called wet rot the potato is affected much in the same way as by the dry rot; but the tubers, instead of becoming hard and dry, are soft. The fungus present in wet rot is supposed to be the same that accompanies dry rot. The potato disease *par excellence* was prevalent on both sides of the Atlantic in the year 1845. Usually the first sign of this disease is the appearance of brown patches upon the haulms and leaves. These spots appear about the time the plants attain their full growth, and when carefully examined are found to be surrounded by a ring of a paler color. The whole of this outer ring is infested with a fungus called the *Botrytis* or *Peronospŏra infestans*, which is a constant accompaniment of the disease, if not its cause. If the weather be dry the progress of the disease is slow, but if a moist warm day supervene it will be found that the mold spreads with great rapidity, and sometimes the whole plant becomes putrid in a few days. The disease first shows itself in a tuber by appearing as a brownish spot, and the part affected may be cut out, leaving the remainder quite wholesome. None of the plans adopted for mitigating the potato disease have been very effective. The potato is also attacked by various insects, the most destructive being the Colorado beetle. The tubers consist almost entirely of starch, and being thus deficient in nitrogen, should not be too much relied on as a staple article of diet. Potatoes are extensively used as a cattle-food, and starch is also manufactured from them. In Maine, Vermont, and Northern New York this is an important industry. Enormous crops of this valuable esculent are grown in the United States, and much attention has been given to their improvement. Its cultivation has also extended widely over the earth.

Potato-bug, a name given in America to the *Colorado beetle* (which see), from the injury caused by it to the potato.

Potchefstroom (pot'shef-strōm), a town in the Transvaal, South Africa, on the Mooi River, about 25 miles N. of the Vaal River. Pop. 10,765.

Potemkin (po-tem'kin), GREGORY ALEXANDROVITCH, a Russian general, a favorite of the Empress Catharine II, born in 1736; died in 1791. Descended from an ancient Polish family, and early trained to the military profession, he soon after her accession attracted the attention of Catharine, who appointed him colonel and gentleman of the chamber. Soon after he gained the entire confidence of Catharine, and became her avowed favorite. From 1776 till his death, a period of more than fifteen years, he exercised a boundless sway over the destinies of the empire. In 1783 he suppressed the khanate of the Crimea, and annexed it to Russia. In 1787, being desirous of expelling the Turks from Europe, he stirred up a new war, in the course of which he took Oczakoff by storm (1788). In the following year (1789) he took Bender, but as the finances of Russia were now exhausted Catharine was desirous of peace. Potemkin, however, resolved on conquering Constantinople, resisted the proposal to treat with the enemy, and went to St. Petersburg to win over the empress to his side (March, 1791); but during his absence Catharine sent plenary powers to Prince Repnin, who signed a treaty of peace. When Potemkin learned what had been done he set out for the army, resolved to undo the work of his substitute; but he died on the way, at Nicolaieff.

Potential (pō-ten'shul), a term in physics. If a body attract, according to the law of universal gravitation, a point whether external or of its own mass, the sum of the quotients of its elementary masses, each divided by its distance from the attracted point, is called the *potential*. The potential at any point near or within an electrified body is the quantity of work necessary to bring a unit of positive electricity from an infinite distance to that point, the given distribution of electricity remaining unaltered.

Potential Energy, that part of the energy of a system of bodies which is due to their relative position, and which is equal to the work which would be done by the various forces acting on the system if the bodies were to yield to them. If a stone is at a certain height above the earth's surface the potential energy of the system consisting of the earth and stone, in virtue of the force of gravity, is the work which might be done by the falling of the stone to the surface of the earth.

Potential Mood, that mood of a verb which expresses an action, event, or circumstance as merely possible, formed in English by means of the auxiliaries *may* or *can*.

Potentilla (pō-ten-til'a), a genus of herbaceous perennials, nat. order Rosaceæ, found chiefly in the temperate and cold regions of the northern hemisphere, containing about 120 species. They are tall or procumbent herbs, rarely undershrubs, with digitate or unequally pinnate leaves, and yellow, red, purple, or white flowers. Some are favorite garden flowers. *P. anserīna* is also called silver-weed, goose-grass, or wild tansy, the leaves of which are greedily devoured by geese; and *P. fragariastrum*, barren strawberry. *P. reptans* is a well-known creeping plant with conspicuous yellow flowers. The roots of *P. anserīna* are eaten in the Hebrides, either raw or boiled. *P. Tormentilla* is used in Lapland and the Orkney Islands both to tan and to dye leather, and also to dye worsted yarn. It is also employed in medicine as a gargle in the case of enlarged tonsils and other diseases of the throat, and for alleviating gripes in cases of diarrhœa.

Potenza (pō-tent'sȧ), a town of Southern Italy and a bishop's see, capital of the province of the same name, on a hill of the Apennines near the Basento, 85 miles E. S. E. of Naples. It is walled, and is indifferently built. It suffered severely by earthquake in 1857, most of the buildings having fallen and many lives were lost. Pop. (1911) 16,672.—The province is partly bounded by the Gulf of Taranto and the Mediterranean. Its chief productions are maize, hemp, wine, silk, cotton.

Poterium (pō-tē'ri-um), a genus of plants, nat. order Rosaceæ and suborder Sanguisorbeæ. *P. Sanguisorba*, or salad-burnet, which grows on dry and most frequently chalky pastures, is said to be native about Lake Huron. It is valuable for fodder, and is used in salad. It has pinnate leaves and tall stems surmounted by dense heads of small flowers.

Poti (pō'tyē), a Russian town in Transcaucasia, on the eastern coast of the Black Sea. It has extensive harbor works, and is connected by railway with Tiflis, but the trade is being drawn away by Batoum. Pop. 7666.

Pot Metal, an inferior kind of brass (copper, 10 parts; lead, 6 to 8), used for making various large vessels employed in the arts. Also a kind

of stained glass in which the colors are incorporated with the substance by being added while the glass is in a state of fusion.

Potocki (po-tots'ki), an ancient Polish family, taking its name from the castle of Potok, and still holding possessions in Galicia and the Ukraine. Among its most distinguished members was Count Ignatius, grand marshal of Lithuania before the downfall of Poland, and a fellow-patriot of Kosciusko, born 1751. In 1791 he took refuge in Saxony, and published a political tract upon the establishment and fall of the constitution, returning, however, to share in the last struggle for independence. He then passed some time in the prisons of St. Petersburg and Warsaw, and died at Vienna 1809.

Potomac (pō-tō'mak), a river which forms the boundary between Maryland and Virginia, passes Washington, and after a course of nearly 400 miles flows into Chesapeake Bay, being about 8 miles wide at its mouth. The termination of the tidewater is at Washington, about 125 miles from the sea, and the river is navigable for large ships for that distance. Above Washington are several falls which obstruct navigation.

Pot'oroo. See *Kangaroo Rat.*

Potosi (pot-o-sē'; common pronunciation, po-tō'sē), a city of Southern Bolivia, in the department of same name, on the slope of the mountain mass of Cerro de Pasco, more than 13,000 feet above the sea-level, in bare and barren surroundings. It is regularly built, and has a cathedral, a mint, etc. It has long been celebrated for its silver mines, which were at one time exceedingly productive, and have again begun to show an improved return. The city was founded in 1547, and the population increased so rapidly that in 1611 it amounted to 150,000, but the 1915 estimate was 29,795.—The department has an area of 45,031 square miles, and is celebrated for its mineral wealth, especially silver. Pop. 531,000.

Pot-pourri (pō-pö-rē; French) signifies the same as *olla podrida* (which see); also, and more generally, a musical medley, or a literary composition made up of parts put together without unity or bond of connection.

Potsdam (pots'dam), a town in Prussia, a bishop's see, capital of the province of Brandenburg, and the second royal residence of the kingdom, is charmingly situated in the midst of wooded hills, 17 miles southwest of Berlin, on the Havel, which here has several lakes connected with it. It is, on the whole, one of the handsomest and most regularly built towns in Germany, and with its suburbs now covers a large space. The principal edifices are the royal palace (remodeled 1750), with interesting memorials of Frederick the Great; Garrison Church, containing the tombs of William I and Frederick the Great; the Nikolai Church, the French Protestant Church, built after the model of the Pantheon at Rome; the town-house; and the Barberini Palace, erected by Frederick the Great in imitation of that at Rome, but rebuilt in 1850-52. Immediately to the west, outside the Brandenburg Gate (resembling a Roman triumphal arch), are the palace and park of Sans Souci. The palace, a building of one story, was erected under the direction of Frederick the Great; the grounds are finely laid out, and contain various fountains, etc., and an orangery 330 yards long. In the same neighborhood is the New Palace, a vast brick building exhibiting much gaudy magnificence. A third palace in the environs of the town is called the Marble Palace. Potsdam was an unimportant place till the Great Elector selected it as a place of residence and built the royal palace (1660-71). Pop. (1910) 62,243.

Potstone (pot'stōn; *Lapis ollāris*) a species of talc containing an admixture of chlorite. Its color is green of various shades; it is greasy and soft, but becomes hard on being exposed to the air. It derives its name from its capability of being made into vases, etc., by turning. It was obtained by the ancients from quarries in the island of Siphnos and in Upper Egypt. It is now quarried in the Valais in Switzerland, in Norway, Sweden, Greenland, and the neighborhood of Hudson Bay.

Pott (pot), AUGUST FRIEDRICH, a German philologist, born in 1802. He studied at Göttingen, became a teacher in the gymnasium at Celle, and subsequently privat-docent in the University of Berlin. He wrote *Researches in the Etymology of the Indo-Germanic Languages*, etc. He died in 1887.

Potter (pot'ėr), HENRY CODMAN, author and divine, was born at Schenectady, New York, in 1835. He entered the Protestant Episcopal ministry, and became bishop of New York City in 1887. He published numerous works and was an energetic social reformer. In 1900 he visited the Philippines and published his views thereon. He died in 1908.

Potter, JOHN, an English classical scholar and divine, primate of

all England, born in 1674, was the son of a linen-draper of Wakefield. In 1706 he became chaplain to Queen Anne. In 1708 he was appointed regius professor of divinity at Oxford, in 1715 was raised to the see of Oxford, and in 1737 appointed Archbishop of Canterbury. He died in 1747. His works include *Archæologia Græca*, a work on Greek antiquities, *A Discourse on Church Government* (1707), an edition of *Clemens Alexandrinus* (1714), and theological works (Oxford, 1753).

Potter, PAUL, a celebrated Dutch painter of animals, born at Enkhuisen in 1625. He received his first instruction in art from his father, Pieter Potter (1587-1655), a painter of some note. He devoted himself specially to the study of animals, producing his first-signed picture, *The Herdsman*, in 1643. His works, specimens of which are in the more important European galleries, are highly esteemed. His coloring is brilliant, and the separate parts are delicately executed, yet without stiffness or mannerism. His pictures are generally of small size, but there is a celebrated one of large size in the museum of The Hague. It represents a man and cattle, with a bull in the foreground, and is known as Paul Potter's bull. He died at Amsterdam in 1654, at the early age of twenty-nine. His engravings are much esteemed, and his paintings command a high price.

Successive Stages of Earthenware Vessel on the Potter's Wheel.

Potter's Clay. See *Clay*.

Pottery (pot'ėr-i), the art of forming vessels or utensils of any sort in clay. This art is of high antiquity, being practiced among various races in prehistoric times. We find mention of earthenware in the Mosaic writings. The Greeks had important potteries at Samos, Athens, and Corinth, and attained great perfection as regards form and ornamentation. Demaratus, a Greek, the father of Tarquinius Priscus, king of Rome, is said to have instructed the Etruscans and Romans in this art. Glazed earthenware was long supposed to be of no older date than the ninth century of our era, and to have originated with the Arabs in Spain; but the discovery of glazed ware in Egypt, of glazed bricks in the ruins of Babylon, of enameled tiles and glazed coffins of earthenware in other ancient cities, proves that this is not the case. The Arabs, however, seem to be entitled to the credit of having introduced the manufacture of glazed ware into modern Europe. The Italians are said to have become acquainted with this kind of ware as it was manufactured in the island of Majorca, and hence they gave it the name of *majolica*. They set up their first manufactory at Faenza in the fifteenth century. In Italy the art was improved, and a new kind of glaze was invented, probably by Luca della Robbia. The French derived their first knowledge of glazed ware from the Italian manufactory at Faenza, and on that account gave it the name of *faïence*. About the middle of the sixteenth century the manufactory of Bernard Palissy at Saintes in France became famous on account of the beautiful glaze and rich ornaments by which its products were distinguished. A little later the Dutch began to manufacture at Delft the more solid but less beautiful ware which thence takes its name. The principal improver of the potter's art in Britain was Josiah Wedgwood in the eighteenth century. Porcelain or chinaware first became known in Europe about the end of the sixteenth century through the Dutch, who brought it from the East. See *Faïence* and *Chinaware*.

Though the various kinds of pottery and porcelain differ from each other in the details of their manufacture, yet there are certain general principles and processes which are common to them all. The first operations are connected with the preparation of the potter's paste, which consists of two different ingredients, an earthy substance, which is the clay proper; and a siliceous substance, which is necessary to increase the firmness of the ware, and render it less liable to

shrink and crack on exposure to heat. The clay is first finely comminuted, and reduced to the consistency of cream, when it is run off through a set of wire, gauze, or silk sieves into cisterns, where it is diluted with water to a standard density. The other ingredient of the potter's material is usually ground flints, or flint powder, as it is called. The flint nodules are reduced to powder by being heated and then thrown into water to make them brittle. They are then passed through a stamping mill and ground to fine powder; which, treated in much the same way as the clay, is finally passed as a creamy liquor into a separate cistern. These liquors are now mixed in such measure that the dry flint-powder bears to the clay the proportion of one-sixth or one-fifth, or even more, according to the quality of the clay and the practice of the manufacturer. The mixture is then forced into presses, lined with cloth, by means of a force-pump, the cloth retaining the clay and allowing the water to escape. The clay now forms a uniform inelastic mass, which is cut into cubical lumps and transferred to a damp cellar, where it remains until a process of fermentation or disintegration renders it finer in grain and not so apt to crack in the baking. But even after this process the ingredients composing the paste are not intimately enough incorporated together nor sufficiently fine in texture until another operation has been undergone, called *slapping* or *wedging*, which consists in repeatedly breaking the lumps across and striking them together again in another direction, dashing them on a board, etc. This final process of incorporation is now most frequently performed by machinery.

In making earthenware vessels, if they are of a circular form, the first operation after the paste has been made is turning, or what is technically called *throwing* them on the wheel. This is an apparatus resembling an ordinary turning-lathe, except that the surface of the *chuck*, or support for the clay, is horizontal instead of vertical. The chuck is, in fact, a revolving circular table, in the center of which a piece of clay is placed, which the potter begins to shape with his hands. The rotary motion of the table gives the clay a cylindrical form in the hands of the potter, who gradually works it up to the intended shape. It is then detached from the revolving table and dried, after which, if intended for finely-finished ware, it is taken to a lathe and polished. It is at this stage that the handles and other prominent parts are fitted on, which is done by means of a thin paste of clay called *slip*. The articles are now removed to a room in which they are dried more thoroughly at a high temperature. When they have reached what is called the *green* state they are again taken to a lathe and more truly shaped, as well as smoothed and burnished. When the articles are not of a circular form, and accordingly cannot be produced by means of the wheel, they are either pressed or cast in molds of plaster of Paris. In the former case the paste used is of the same consistence as that employed on the wheel; in the latter molds of the same sort are used, but the clay mixture is poured into them in the condition of slip. By the absorption of the water in the parts next the dry mold a crust is formed of greater or less thickness, according to the time that the liquid is allowed to remain. The molds are in two or more pieces, so as to be easily detached from the molded article.

When shaped and dried the articles are ready for the kiln, in which they are exposed to a high temperature until they acquire a sufficient degree of hardness for use. The paste of which the earthenware is composed is thus converted into what is called *bisque* or *biscuit*. While undergoing this process of baking the articles are enclosed in larger vessels of baked fire-clay, called *saggers*, to protect them from the fire and smoke, and to distribute the heat more uniformly. The whole firing lasts from forty to forty-two hours. After the kilns have been allowed to cool very slowly, the articles are taken out, and if they are not to be decorated in color, and sometimes also when they are to be so decorated, they are immersed in a vitrifiable composition called *glaze*, which, after the vessels have been a second time subjected to heat in glazed saggers, is converted into a coating of glass, rendering the vessels impermeable to water.

These processes are all that are necessary to complete a plain earthenware vessel, but very frequently the vessels are adorned with printed or painted decorations executed in colors, such as may be burned into the substance of the article. There are two methods of printing on earthenware: press-printing, which is done on the bisque, and bat-printing, done on the glaze. In both cases an engraving is first executed in copper, and thence transferred, by means of a sheet of paper containing an impression, to the article requiring to be printed; but the processes are slightly different in detail. When the vessel has received its impression it is ready to be fired in the enamel kiln. Painting on earthenware is effected with a brush over the glaze.

All the numerous varieties of earthenware are made in the manner just described, with only slight modifications in the nature of the ingredients of their composition or the processes of manufacture. Stoneware may be formed of the clays which are used for other vessels, with the addition of different sorts of sand, and sometimes of cement. A greater degree of heat is applied than in the case of ordinary earthenware, and when some fluxing substance is added it has the effect of producing that state of semifusion which is the distinguishing quality of stoneware. A kind of semivitrified ware, first made by Wedgwood, takes its name from him. It is made of two different kinds of pastes, both very plastic. This ware is incapable of taking on a superficial glaze; but by a process called *smearing*, which is simply baking at a high heat in saggers coated internally with a glaze, acquires a remarkable luster.

Porcelain or chinaware is formed only from argillaceous minerals of extreme delicacy, united with siliceous earths capable of communicating to them a certain degree of translucency by means of their vitrification. Porcelain is of two kinds, hard and tender. Both consist, like other earthenwares, of two parts — a paste which forms the biscuit, and a glaze. The biscuit of hard porcelain is composed of kaolin or china clay, and of decomposed felspar. The glaze consists of a felspar rock reduced to a fine powder, and mixed with water, so as to form a milky liquid into which the articles are dipped after a preliminary baking. Tender porcelain biscuit is made of a vitreous frit, composed of siliceous sand or ground flints, with other ingredients added, all baked together in a furnace till half-fused, and then reduced to a condition of powder. The glaze of tender porcelain is a specially prepared glass ground fine, and made into a liquid by mixing with water. The processes employed in manufacturing porcelain wares are very much the same as those used for other kinds of earthenware, but requiring more delicacy and care. The biscuit paste even of hard porcelain has so little tenacity compared with that of earthenware that it cannot easily be shaped on the wheel, and is consequently more frequently molded. The paste of tender porcelain is still less tenacious, so that the wheel cannot be used for it at all, and a little mucilage of gum or black soap must be added before it can be worked even in molds. During the baking, too, it becomes so soft that every part of an article must be supported. Tender porcelain receives two coats of glaze.

Metallic oxides incorporated with some fusible flux, such as borax, flint, etc., are used for painting on porcelain. The colors are mixed with essential oils and turpentine, and applied by means of a camel's-hair brush. When the painting is finished the vessels are baked in a peculiar kind of ovens called *muffles*, which are also used for fixing the printed figures on the glaze of stoneware. By the operation of the furnace most of the colors employed in painting porcelain become quite different, and the change which takes place in them is usually through a series of tints, so that the proper tint will not be obtained unless the baking is stopped precisely at the proper time. Sometimes porcelain has designs etched on it by means of fluoric acid. Sculptures also are executed by casting in molds in various kinds of porcelain, called statuary porcelain, Parian, Carrara, etc. The most important seats of the manufacture of earthenware in the United States are at Trenton, New Jersey, and East Liverpool, Ohio.

Pottinger (pot'in-jėr), Eldred, a British officer, famed for his defense of Herat in 1838, was born in Ireland in 1811, and went to Bombay at the age of 17 as artillery cadet. In 1837 he traversed Afghanistan in disguise, and reached Herat after many risks. The city was then held by an Afghan prince, and was besieged by the Persians for nearly a year, when it was relieved by a British diversion in the Persian Gulf. The credit of the defense was given to Pottinger. Major Pottinger took a leading part in the disastrous Afghan war of 1841-42, and as political agent had to sign terms with the rebels, which were afterwards repudiated by Lord Ellenborough. A trial by court-martial only served to show his conduct in brighter colors. He died in 1843 at Hong-Kong.

Pottinger, Sir Henry, Bart., a distinguished soldier and diplomatist, uncle of the above, born in 1789. He went to India as a cadet in 1804, and soon became known for his energy and administrative ability. Rising gradually to the rank of major-general, he was, after the Afghan campaign in 1839, raised to the baronetage as a reward for his services. In 1841 he went as minister-plenipotentiary to China, and contributed much to bring hostilities to a conclusion. He was successively governor and commander-in-chief of Hong-Kong (1843), governor of the Cape of Good Hope (1846), governor and commander-in-chief of Madras (1850-54). He died in 1856.

Pottstown (pots'toun), a borough of Montgomery Co., Pennsylvania, on the Schuylkill River, 40 miles W. N. W. of Philadelphia, is a thriving manufacturing town, with extensive iron and other industries, including numerous rolling mills, nailworks, steel mills, hosiery and silk factories, textile mills, etc. Pop. (1910) 15,599; (1920), 17,431.

Pottsville (pots'vil), a city, county seat of Schuylkill Co., Pennsylvania, on Schuylkill River, 93 miles N. W. of Philadelphia. It is in the center of the great anthracite coal field, and has large steel plants, textile mills, and the extensive shops of the Pennsylvania and the Philadelphia & Reading railroads, besides numerous manufactures of shoes, shirts, wood-working machinery, and many other products. Pop. (1910) 20,236; (1920) 21,876.

Pouched Rat, or POUCHED MOUSE, the name applied in America to the pouched or pocket gopher.

Poudrette (pö-dret'), a name given in France to a powdery manure obtained from ordure. It takes a long time to prepare, is pulverulent, of a brown color, and almost inodorous. Potash salts or other materials are sometimes added.

Poughkeepsie (po-kip'si), a city, county seat of Dutchess Co., New York, on the east bank of the Hudson River, here crossed by a cantilever bridge. It is situated midway between the Highlands and the Catskills, 72 miles N. of New York City, and commands a magnificent panorama of the river. It is the center of an agricultural and fruit-growing region, on the main line of travel between New York and Chicago; and has over seventy lines of manufacture, employing 8000 people. Its products include mill supplies, underwear, farm implements, cream separators, elevators, machine-shop products, etc. It is the home of Vassar College (q. v.), Eastman Business College and Putnam Hall, and other educational establishments. Pop. (1910) 27,936; (1920) 35,000.

Poulpe (pölp). See *Octopus.*

Poultice (pōl'tis), in medicine, a soft, moist application applied externally to some part of the body either hot or cold, but generally the former. The simple poultice is made with linseed meal and boiling water, spread out with uniform thickness on a cloth or rag, and is used where it is desired to hasten the progress of inflammation. Its moisture causes relaxation of the skin, and thereby lessens the discomfort or pain. It acts also as a counter-irritant, producing a redness and congestion of the skin. Disinfecting poultices are made with charcoal or some non-irritating antiseptic lotion. Bread-and-milk poultices are also common. The best-known poultice, however, is the mustard-plaster. This may be made by mixing linseed-meal with water, and adding mustard. It produces a rapid but mild counter-irritation, indicated by a redness of the skin, and is useful in cases of bronchitis, lumbago, and similar affections.

Poultry (pōl'tri), a general name for all birds bred for the table or kept for their eggs. The birds most commonly included under this designation are the common fowl, the peafowl, the guinea fowl, the turkey, goose, and duck. There is a great difference between the varieties of the domestic fowl and choice of variety must depend on the purpose for which the fowls are kept, whether for eggs or meat or both, and whether sitters or non-sitters are desired. Common egg-producing breeds in America are Leghorns and Minorcas, which lay white-shelled eggs and are non-sitters. Plymouth Rocks, Wyandottes, Orpingtons and Rhode Island Reds are good for general farm purposes. They are sitters and producers of brown-shelled eggs as are also the Brahmas, Cochins and Langshans. The science of poultry culture has made rapid advances within recent years, America leading the way. Results depend largely upon careful feeding as well as upon careful breeding. The proper ratio for feeding fowls has been widely discussed, but the general conclusion seems to be that about 1 : 5 is the best, and that there should be about 18 per cent. of albuminoids, 7 of fats and 75 of carbohydrates. Fowls fattening require more fats; those constantly laying, more albuminoids. In America artificial incubation is widely practiced. In general poultry farmers use long rows of buildings divided into pens or houses with enclosed yards in front of each, with 'scratching sheds' for winter use. Another system is the 'colony' plan, houses accommodating forty or fifty hens each being placed at some distance apart, with no fencing. Larger fowls, called 'roasters' to distinguish them from the 'broilers,' which are unfattened and sold when weighing from one and a half to two pounds, are usually reared in confinement, being killed at the weight of seven or eight pounds.

Pounce (pouns; a corruption of *pumice*), a fine powder formerly used to prevent ink from spreading on paper, now superseded by blotting-paper. The term is also applied to charcoal dust

or some other powder used in embroidery or engraving, to trace a design or pattern by being sifted through pinholes in the paper.

Pound, in English law, an enclosed place for keeping cattle which have strayed on another man's ground, until they are redeemed. A pound may belong to a parish or village or to a manor.

Pound, an English weight of two different denominations, *avoirdupois* and *troy*. The pound *troy* contains 5760 grains, and is divided into 12 ounces; the pound *avoirdupois*, contains 7000 grains, and is divided into 16 ounces. The *pound*, or *pound sterling*, the highest monetary denomination used in British money accounts, and equal to 20 shillings, was so-called from its originally being equal to a quantity of silver weighing one pound. The pound is used strictly as a money of account, the coin representing it being the sovereign. See *Money*.

Poundage, a rate of so much per *pound*, sometimes a percentage deducted from wages paid in advance. Also, a tax formerly levied on merchandise by weight.

Poushkin. See *Pushkin*.

Poussin (pö-saṇ), GASPAR, a French landscape painter, born in Rome in 1613. His real name was Dughet; but having been placed under the instructions of the celebrated Nicolas Poussin, who had married his sister, he assumed the surname of his master. He lived mostly in Rome or its neighborhood, and had extraordinary facility of execution, so that his works are very numerous, specimens being found in all the chief collections in Europe. His paintings are distinguished by grandeur and rather somber characteristics, and storms or high winds were subjects in which he excelled, though he was also highly successful with morning and evening effects. The pictures of his maturer period owe much to the influence of Claude. Many of his figures are said to have been supplied by Nicolas Poussin. He died about 1675.

Poussin, NICOLAS, a distinguished French historical and landscape painter, born at Andelys, in Normandy, in 1594. He first studied in his native place, and then at Paris, under masters of little merit; but he made astonishing progress. He had already acquired considerable reputation when, in 1624, he went to Italy for the purpose of improving himself in his art; there he lodged with Du Quesnoy, the sculptor, and attended the school of Domenichino. At Rome he fell into great want, but was assisted by a Frenchman, Jacques Dughet, and by him tended through an illness brought on by overwork. In 1630 Poussin married the daughter of his benefactor. About this time his affairs began to improve. He found liberal patrons in Cardinal Barberini and in the Cavaliere Cassiano del Pozzo, for whom he painted the celebrated *Seven Sacraments*, now at Belvoir Castle. He was also invited to paint the great gallery of the Louvre; and his successes gained him the position of first painter to Louis XIII, with a pension of 3000 livres. From 1640 to 1642 he resided in Paris; but the rivalry of French painters and the want of appreciation of his works evinced by the Parisians induced him to return to Rome, where he lived until his death in 1665. He modeled statues and reliefs with great skill, and might have become an eminent sculptor. Historical and landscape paintings, however, were the chief subjects of his genius; in these his style is grand and heroic, and his invention fertile. He has been called the Raphael of France. Among his more celebrated works are the *Seven Sacraments*, the *Death of Germanicus*, the *Capture of Jerusalem*, the *Plague of the Philistines*, *Abraham's Servant and Rebecca*, the *Adulteress*, the *Infant Moses*, *Moses and the Daughters of Jethro at the Well*, *Moses bringing Water from the Rock*, the *Worship of the Golden Calf*, *John Baptizing in the Wilderness*, etc., and many fine landscapes.

Pout. See *Bib*.

Pouter (pou'tẽr), a variety of fancy pigeon, the chief character of which is its very projecting breast.

Povoa de Varzim (pō-vō'a dā vārzeṇ'), a seaport and bathing place of Portugal, about 16 miles northwest of Oporto. Pop. 12,623.

Powan (pou'an; *Coregŏnus clupeoides*), a fish inhabiting Loch Lomond, in Scotland, and also known as the fresh-water herring.

Powderly (pou'der-li), TERENCE VINCENT, was born at Carbondale, Pennsylvania, in 1849, became a machinist, and was master workman of the Knights of Labor 1879-93. He was elected mayor of Scranton for three terms, and was made commissioner-general of immigration in 1897. He was admitted to the bar in 1894, and to the bar of the U. S. Supreme Court in 1901. In 1906 he was sent abroad to study causes of immigration, and in 1907 was made chief of the Division of Information in the Bureau of Immigration. He wrote *Thirty*

Years of Labor, and *History of Labor Day*.

Powell (pou'el), JOHN WESLEY, geologist, was born in Mount Morris, New York, in 1834. In the Civil war he rose to be lieutenant-colonel, losing an arm at Shiloh. In 1867 and years following, under direction of Smithsonian Institution and Department of the Interior, he conducted the geographical and geological survey of the Rocky Mountain region, and was the first to make the perilous journey down the Colorado River, and through its cañon. His *Contributions to North American Ethnology* are embraced in 3 vols. He died in 1902.

Powell, MAUD, an American violinist, born at Peru, Illinois, in 1868; died 1920. She made her début in Berlin, and returning to America was one of the favorite soloists with the great orchestras. She toured in Europe, South Africa, and Australia, as well as the American continent.

Power of Attorney, in law, is a deed or written instrument whereby one person is authorized to act for another as his agent or attorney, either generally or in a special transaction.

Powers (pow'ers), HIRAM, sculptor, the son of a farmer, was born at Woodstock, Vermont, in 1805. He early displayed great ingenuity in mechanical matters, and became somewhat noteworthy on this account while acting as a shopman and assistant to a clockmaker of Cincinnati. He next obtained employment in a museum in that city. At this period he formed the acquaintance of a German sculptor, and having been taught modeling by him, determined to become himself a sculptor. In 1835 he went to Washington, and had sufficient success there to enable him to proceed to Italy. He now settled in Florence, where he resided until his death in 1873. He is distinguished in portraiture, and produced busts of many of the most noted American statesmen. His most famous ideal works are the statue of *Eve*, the *Greek Slave*, and the *Fisher Boy*.

Powhatan (pow'ha-tan), an Indian chief of Virginia, born about 1550; was the father of Pocahontas (which see). He died in 1618. He was friendly to the settlers, but after his death the confederacy of tribes of which he was chief became hostile, and in the conflicts that ensued they were nearly all destroyed.

Powers, THE GREAT, a term of modern diplomacy, by which have long been meant Britain, France, Austria, Germany, Italy, and Russia, and to which must now be added the United States and Japan.

Poynings' Law (poi-nings'), or the statute of Drogheda, an act of the Irish Parliament, passed in 1495, whereby all general statutes before that time made in England were declared of force in Ireland. It was so named from Sir Edward Poynings, deputy of Ireland under Henry VII in 1494, when he suppressed the revolt of Perkin Warbeck. See *Ireland* (*History*).

Poynter (poin'tėr), SIR EDWARD JOHN, son of Ambrose Poynter, an architect, was born in Paris in 1836; received his art training at the schools of the Royal Academy and under Gleyre in Paris; gained a reputation by his *Israel in Egypt*, exhibited in 1867, and *The Catapult* (1868); painted the cartoons for the mosaic of *St. George* in the Westminster Palace (1869). He produced various other notable paintings. He was elected an associate in 1869 and a Royal Academician in 1876, was the first Slade professor of art at University College, London, and was director for art at South Kensington for some years. He was made President of the Royal Academy in 1896. He died July 26, 1919.

Pozoblanco (pō-thō-blân'kō), a town in Spain, in the prov. of and 36 miles north of the city of Cordova. Its inhabitants are chiefly employed in agriculture and as muleteers. Pop. 12,792.

Pozzolana, or POZZUOLANA (pot-sö-u-lâ'na), a sort of mortar produced in Italy and formed of volcanic ashes. When mixed with a small portion of lime it quickly hardens even under water. This singular property renders it very useful as a cement in the erection of moles and other buildings in maritime situations. It is much used in Italy as a substitute for mortar, and has received its name from Pozzuoli, the port from which it is shipped.

Pozzuoli (pot-sö-ē'lē), the ancient *Puteoli*, a city and seaport of Southern Italy, 6 miles W. S. W. of Naples, on the shore of the Bay of Baiæ (Golfo di Possuoli), the northwestern portion of the Bay of Naples. (See *Naples*.) The coast forms a natural harbor, which is well sheltered; and a considerable trade and an active fishing is carried on. Pozzuoli is a city of great historic interest. It was founded by the Greeks about 520 B.C., and became under Rome a great center of commerce. St. Paul landed here in the course of his journey to Rome. Pozzuoli was destroyed by the Goths more than once, rebuilt by the Byzantine Greeks, and finally devas-

tated by earthquakes and volcanic eruptions. It abounds in ancient ruins. The cathedral stands on the site of a temple of Augustus, and in one of the lateral walls six Corinthian columns of the old temple are preserved. A ruined Temple of Serapis also remains, enclosed by forty-eight marble and granite columns. On an eminence behind the town stands the ruined amphitheater, resting on three series of arches. In the neighborhood are Lake Avernus, the Grotto of the Sibyl, the baths of Nero, the ruins of Baiæ and Cumæ, etc. Recently Pozzuoli has been considerably altered by the establishment of Armstrong, Mitchell, & Co.'s works for supplying guns, armor-plates, and machinery to the Italian government. Pop. (1906) 17,017.

Practice (prak'tis), in arithmetic, a rule for expeditiously solving questions in proportion, or rather, for abridging the operation of multiplying quantities expressed in different denominations, as when it is required to find the value of a number of articles at so many pounds, shillings, and pence each.

Pradier (prà-di-ā), JACQUES, an eminent sculptor, born at Geneva in 1792. Having gone to Paris in 1809, and studied art in 1813, he gained the prize of the Academy for a bas-relief of *Philoctctes and Ulysscs.* This work procured him admission into the French Academy at Rame. From 1823 he worked constantly at Paris, where his popularity was very great and where he was admitted to the Institute in 1827. His works are of various kinds: religious, monumental, but mainly classical. In execution he ranks as a sculptor of the first class, but his invention and conception are defective, and there is, according to some critics, a decided meretriciousness in his style. He died in 1844. His works comprise: *Centaur and Bacchante, Psyche, Venus, Phrync, The Three Graces,* twelve colossal *Victorics* on the monument of Napoleon I in the Hôtel des Invalides, statue of *Rousseau* at Geneva, etc.

Praed (prād), WINTHROP MACKWORTH, a poet, born in London, England, in 1802. He was educated at Eton, where in 1820 he became one of the principal contributors to a magazine published there called *The Etonian.* From Eton he went to Trinity College, Cambridge, where he obtained for two years in succession the chancellor's prize for an English poem. At this time, like Macaulay, he contributed both in prose and verse to *Knight's Quarterly Magazine.* In 1829 he was called to the bar, and in 1830 and 1831 was returned by St. Germans to Parliament, where he took a prominent part in opposing the passing of the reform bill. He died in 1839. His poems are mostly of a light and elegant character, belonging to the class known as *vers de société,* but they also comprise others in a more serious vein.

Præfect (prē'fect; *præfcctus*), the title of various functionaries of ancient Rome. Of these, the most important was the *præfectus urbi* or *urbis* (prefect of the city). During the kingly period and the early republic the *præfectus urbis* had the right to exercise all the powers of the king or consuls in their absence. After the foundation of the prætorship (see *Prætor*) this office lost its dignity and privileges; but under the empire it was revived as that of chief permanent magistrate of the city, with important military functions. The *præfectus prætorio,* an officer under the empire, was general of the imperial life guards. His position was one of great power, for the troops under his command frequently decided the succession of the imperial throne. (See *Prætorians.*) Many other Roman functionaries bore the title of præfect, such as the *præfectus aquarum,* who had charge of the water supply of the city; the *præfectus ærarii,* who managed the public treasury, etc.

Præmunire (prē-mū-nī're), in English law, a name given to a kind of offense of the nature of a contempt against the monarch and the government. The term is derived from the opening words of the writ preparatory to the prosecution of the offense — *præmonerc* or *præmunire facias A. B.* (Cause A. B. to be forewarned that he appear before us, etc.). The punishment is forfeiture and imprisonment during the sovereign's pleasure. Many of the statutes are now repealed, and prosecutions upon præmunire are unheard of in our times; the last took place during the reign of Charles II.

Præneste (prē-nes'te), the ancient name of Palestrina (which see).

Prætor (prē'tor), an important official in the ancient Roman state. Up to 367 B.C. the title was merely an adjunct to that of consul; but when at that date the consulship was thrown open to the plebeians, the judicial functions of the consul were separated from his other duties and given to a new patrician magistrate, who was entitled the prætor. In 337, after a struggle, the plebeians were also admitted to this office. In 246 B.C. another magistracy, that of *prætor peregrinus,* was instituted for the purpose of settling disputes between foreigners and

between foreigners and citizens; and in distinction from him who filled this office the other functionary was termed *prætor urbānus*. After election the two prætors determined their offices by lot. The *prætor urbānus* was the first in position, and was the chief magistrate for the administration of justice. About B.C. 227 the number of prætors was increased to four; afterwards to six and eight; and under the empire the number varied from twelve to eighteen. After completing his year of office the prætor was often sent as *proprætor* to govern a province. See *Proconsul.*

Prætorians (prē-tor'i-anz), the bodyguard of the Roman emperors, first established as a standing body by Augustus. Under him only a small number of them were stationed in Rome, the rest being in the adjacent towns. Tiberius assembled the whole at Rome, where they were used to quell any sudden popular disturbance. The number of cohorts was raised by Vitellius from nine to sixteen, and under the later emperors they became powerful enough to decide the succession to the throne. They were reorganized and their powers curtailed by Septimius Severus and by Diocletian, and were finally disbanded by Constantine the Great, 312 A.D.

Pragmatic Sanction, a public and solemn decree pronounced by the head of a legislature. In European history several important treaties are called pragmatic sanctions, but the one best known by this name is the instrument by which the German Emperor Charles VI, being without male issue, endeavored to secure the succession to Maria Theresa.

Pragmatism, a name given to a logical development of the scientific method as applied to metaphysical problems, or to the mental attitude that refuses to accept any theory except in as far as it explains facts and is translatable into action. The best authorities on the subject are John Dewey, *Studies in Logical Theory* (1903), and William James, *Pragmatism* (1907).

Prague (prāg; Bohemian, *Praha*, German, *Prag*), the capital of Czecho-Slovakia, a prosperous and well-built city of central Bohemia, on both sides of the Moldau, here crossed by seven bridges; 153 miles northwest of Vienna and 75 miles southeast of Dresden, with both of which it is connected by railway. Its site is a regular basin, cut in two by the river, from the banks of which the houses rise on both sides till they are terminated and enclosed by hills of considerable height. When viewed from the Karlsbrücke, or old bridge, the city presents a most imposing appearance. It was formerly enclosed by a wall and fosse, but these defenses have been demolished. Among the public buildings of Prague are the old castle, or palace of the Bohemian kings; the Roman Catholic cathedral, a Gothic structure (founded 1344), somewhat shapeless from having been only partly finished, though an effort is now being made to complete it; the Jesuit college, called the Clementinum, consisting of churches, chapels, and other buildings, and containing the university library; the Carolinum, or college of law and medicine; the town-hall; the Teynkirche or old church of the Hussites, interesting as containing statues and other works of art and the burial place of the astronomer Tycho Brahe; the palace of Wallenstein, originally a magnificent structure, but now much dilapidated, etc. The manufactures of Prague are of great variety, including gold and silver embroidery, silk, woolen, cotton, and linen goods, porcelain, and jewelry. The suburbs of Karolinenthal and Smichow, the former with 25,000, the latter with 50,000 inhabitants, are quite modern, and are busy industrial centers. From its position on the river Moldau, Prague has free communication with the Elbe, which gives it great facilities for transport in addition to its railway connections. Prague is one of the oldest towns in the kingdom, dating from the eighth century. Its university was founded in 1348, and had at one time about 10,000 students. Recently it was divided into two universities, a German and a Czech or Bohemian, having together more than 3500 students. The city was long greatly disturbed by the struggles between the Roman Catholics and the Hussites. It suffered severely also in the Thirty Years' war. In 1631 the city was captured by the Saxons, who were driven out a few months later by Wallenstein. Since that date it has passed through many vicissitudes. In 1742 it was taken by the French and Bavarians, and two years later capitulated to Frederick the Great. After the Seven Years' war the city made rapid strides. During the Austro-Prussian war in 1866 Prague was occupied by the Prussians, and here the treaty of peace was signed August 23. In 1918 it passed out of Austrian control, becoming the capital of the new state of Czecho-Slovakia (q. v.). Pop. 223,741.

Prahran (prä-ran'), a town in Victoria, Australia, a S. E. suburb of Melbourne. Pop. 41,161. See *Melbourne.*

Prairial. See *Calendar.*

Prairie (prā'ri; French 'meadow'), the name given in the United States to the vast natural meadows or plains of the Mississippi valley, especially lying between it and the Rocky Mountains, and extending northwards into Central Canada. Throughout this immense territory the differences of level are sufficient to produce a steady flow of the rivers, but not so great as to obstruct their navigation, thus securing a unique system of easy intercommunication between all sections of the interior. There is a great sameness in the features of the topography, the vegetable productions, the soil, and geological features. · Some of the prairies that have a peculiarly undulating surface are known as *rolling prairies.* The prairies were formerly treeless, except along the streams, and the annual burning of their dried grass by the Indians is supposed to have given rise to the autumnal mistiness visible in the 'Indian Summer.' They have now much more woodland. Vast herds of buffaloes used to roam over the prairies, but these have been destroyed. Immense tracts are now cultivated, and produce large crops of wheat and maize with little outlay of labor on the part of the farmer, the soil being deep and rich. They constitute, in fact, the great grain-raising region of the United States.

Prairie-dog, or PRAIRIE MARMOT, a small rodent animal, the wistonwish (*Cynomys ludovicianus*), allied to the marmot as well as to the squirrel, and found on the North American prairies west of the Mississippi and east of the Rocky Mountains. These animals live gregariously in burrows, and are characterized by a sharp bark, like that of a small dog, whence their popular name. They are about 1 foot in length exclusive of the tail, which is rather short. Their burrows are quite close together, and have a mound of excavated earth near the entrance, on which the little animals are wont to sit and look around them. These communities are termed 'villages.' A second species, *C. columbiānus,* inhabits the region west of the Rockies. The prairie-dog is not to be confounded with the prairie-squirrel, to which it is allied.

Prairie-hen, the popular name of the pinnated grouse of the United States (*Tetrao cupīdo*). The neck of the male is furnished with neck-tufts of eighteen feathers, and is remarkable also for two loose, pendulous, wrinkled skins, which somewhat resemble an orange on inflation. The prairie-hen is much prized for the table.

Prairie-squirrel, or GOPHER, a name for several animals of North America, of the genus *Spermophĭlus,* found in the prairies in great numbers. They live in burrows, and not on trees, and much resemble the prairie-dog or marmot. They have cheek-pouches, in which their food is carried. This consists of prairie plants with their roots and seeds.

Prairie-wolf, or COYOTE (*Canis latrans*), the small wolf which inhabits the entire western portion of North America, especially the prairies. It is smaller than the gray or timber wolf, very cunning and cowardly, swift of foot, destructive to sheep, and hence continually hunted and trapped.

Prâkrit (prâ'krit), the name of certain Hindu dialects, which acquired greater prominence as the older Sanskrit passed gradually out of use. The modern tongues of India have sprung from the Prâkrit just as the Romance · languages have sprung from the old Italian dialects, and not from the literary Latin.

Prase (prāz), a dark leek-green variety of quartz, the color of which is due to an admixture of hornblende.

Pratique (pra-tēk'), a term used to signify a kind of limited quarantine, which the captain of a vessel is held to have performed when he has convinced the authorities of the port that his ship is free from infectious diseases; more generally, the license to trade after having performed quarantine.

Prato (prä'tō), a town of Italy, in Tuscany, 11 miles northwest of Florence, in a fertile plain, on the right bank of the Bisenzio. It dates from the twelfth century, is surrounded by ancient walls, and is a well-built, cheerful-looking place. The cathedral is very beautiful. Prato has manufactures of woolen, cotton, silk, etc. Pop. (commune) 53,750.

Pratt, county seat of Pratt Co., Kansas, on Ninnesch River, 80 miles w. of Wichita. It has flour mills, creamery, etc. Pop. (1920) 5183.

Pratt, CHARLES, philanthropist, born at Wintertown, Massachusetts, in 1820; died in 1891. He became wealthy through the introduction and sale of astral oil, and in 1887 founded the Pratt Institute in Brooklyn, to which he added an immense tenement house and left it by will an endowment of $2,000,000.

Pratt, ENOCH, philanthropist, born at North Middleboro, Massachu-

setts, in 1808; died in 1896. He grew wealthy in the iron business in Baltimore and founded various benevolent institutions, including the free public library of Baltimore, to which he left an endowment of over $1,000,000.

Prawn (prạn; *Palæmon*), a genus of crustaceans, order Decapoda, section Macrura ('long-tailed'). The common prawn (*Palæmon serratus*) is the most familiar species, and resembles the shrimp. It attains an average length of from 3 to 5 inches. The tail is broad and flat, and its terminal plates are fringed with long hairs. The color is light gray spotted with purple, which is brightest in the antennæ. It is well known and esteemed as an agreeable article of food.

Praxiteles (praks-it'e-lēz), one of the greatest sculptors of ancient Greece, a citizen, if not a native, of Athens, flourished about 364 B.C. He and his contemporary Scopas stand at the head of the later Attic school, so called in contradistinction to the earlier Attic school of Phidias. Without attempting to rival Phidias in grandeur, Praxiteles chose subjects which demanded a display of the human form, especially in the female figure. The finest is said to have been the *Cnidian Aphroditē* (Venus), whom he was the first to represent naked. The group of *Niobe and her Children*, now in existence at Florence, is by some attributed to Praxiteles and by others to Scopas. His two statues of *Eros* (Cupid) were also celebrated. One of them, placed in the Temple of Eros at Thespia, and the statue of a satyr were considered by Praxiteles, according to Pausanias, as his finest works. An excellent copy of the latter still exists. Among his works were also statues of *Apollo*, *Dionysos*, *Demeter*, etc., in marble and in bronze, which served as models to succeeding artists. Quite recently, a marble statue of *Hermēs* by Praxiteles has been discovered at Olympia.

Prayer (prār), a petition offered to a divinity. The Scriptures tacitly assume that prayer was offered to God from the beginning of the world; and although we read that 'men began to call upon the name of the Lord' after Seth was born, we are forbidden by all commentators to connect this statement with the origin of prayer. It is not, however, until the time of Abraham that prayer comes first distinctly into notice. As the altar appears to have been the special place for prayer in the patriarchal age, so was the tabernacle under the Mosaic covenant until the temple, 'the house of prayer,' was built. From the time of the dedication of Solomon's temple the Jews appear to have gone there to pray, and to have turned their faces towards it if they were prevented from going there; and this custom prevails among the Jews at the present time, as does the similar custom among the Mohammedans, who turn their faces towards the sacred Kaaba at Mecca. When we come to New Testament times we meet with synagogues established as places for the public worship of God, and for reading his word. Christ taught that prayer should be offered to God in his name in order to ensure an answer. Henceforward Christ became to the Christian what the temple was to the Jew. The posture of the body in prayer is left undecided in Scripture, and although Christ gave his disciples a form of prayer of the most universal application, it does not follow that men may not pray according as each experiences special wants.

Prayer for the dead is a practice rejected by Protestants as having no scriptural warrant, but which prevails in the Roman Catholic, and the Greek and other Eastern churches. The custom seems to have existed in most ancient religions. The doctrine and practice came to the Christian Church through the Jews (2 Maccabees, xii, 43, 45). The first of the Christian fathers who mentions prayer for the dead is Tertullian; but he speaks of the usage as long established in the church; such prayers are frequently alluded to by St. John Chrysostom, Cyril of Jerusalem, and St. Augustine. In the burial service of the first Book of Common Prayer of the English Church some prayers for the dead appeared, but they were deleted from the second book, and are not found in the subsequent revisions.

Praying Wheel, an apparatus used by the Buddhists of Tibet and other parts of the East, as a mechanical aid to prayer. The prayers are inscribed on a cylinder or wheel, fixed on an axle, every turn of which counts as a prayer uttered. To facilitate this holy duty they are often set in the bed of a running stream to be turned incessantly by the water, or may be placed in such a way as to be turned by the current of cool air flowing into a tent.

Pre-Adamites, traditional inhabitants of the earth prior to the creation of Adam. Ancient legends or traditions of the East speak of nations and empires existing before Adam's creation, and of a line of kings who ruled over them. In modern times

the subject was taken up by Isaac de la Peyrère, who, in a work published in 1655, maintained that the Jews were the descendants of Adam, and the Gentiles those of a long anterior creation, founding his opinions on Romans, v, 12-14.

Prebend (preb'end), a yearly stipend paid from the funds of an ecclesiastical establishment, as of a cathedral or collegiate church. *Prebendary* is the person who has a prebend. A *simple* prebend is restricted to revenue only; a *dignitary* prebend is one which has a jurisdiction annexed.

Precedence (prē-sē'dens), the order in which men and women follow each other according to rank or dignity in a state procession or on other public occasions. In England the order of precedence depends partly on statutes, and partly on ancient usage and established custom. Questions arising on matters of precedence depending on usage are hardly considered as definitely settled, and are in a great measure left to the discretion of the officers of arms. The sovereign, of course, is always first in order of precedence, after whom in descending order follow the Prince of Wales, sons of the sovereign, grandsons of the sovereign, brothers of the sovereign, uncles of the sovereign, the sovereign's brothers' or sisters' sons, the Archbishop of Canterbury, the Lord High Chancellor, and so on through the high state dignitaries, the various ranks of the peerage, etc. The order of precedence among women follows the same rules as that among the men. By the acts of Union of Scotland and Ireland the precedence in any given degree of the peerage has been established as follows: — 1. Peers of England; 2. Peers of Scotland; 3. Peers of Great Britain; 4. Peers of Ireland; 5. Peers of the United Kingdom and Peers of Ireland created subsequent to the Union. Rules of precedence are also strictly observed in some of the European states, but are of minor importance in the United States.

Precedent (pres'e-dent), in law, a judicial decision which serves as a rule for future determinations in similar cases. Precedents, strictly speaking, are binding on tribunals only when they are actual decisions of the point in question; what is termed an extrajudicial opinion or *obiter dictum* — the opinion of a judge pronounced where it was not called for to decide the issue — can have authority only from the character of the judge, and not as a precedent. Precedents are now of as much authority in courts of equity as in those of common law.

Precentor (prē-sen'tur), in old religious foundations, an important official in a chapter, whether cathedral or collegiate, who led the singing. He ranked generally, although not universally, next to the dean; but in modern cathedral foundations he is usually a minor canon, and in consequence has lost much of his prestige. He is still, however, everywhere the conductor of the choral service, and superintendent of the choir.

Preceptory (prē-sep'tu-ri), in mediæval history, a religious house of the Knights Templars, subordinate to the temple or principal house of the order in London. It was under the government of one of the more eminent knights appointed by the grand-master.

Precession of the Equinox, a slow motion of the line of intersection of the celestial equator or equinoctial and the ecliptic, which causes the positions occupied by the sun at the equinox (the equinoctial points, which see) to move backward or westward at the mean rate of 50.25″ per year. This motion of the equinox along the ecliptic carries it, with reference to the diurnal motion, continually in advance upon the stars; the place of the equinox among the stars, with reference to the diurnal motion, thus precedes at every subsequent moment that which it previously held, hence the name. This sweeping round in the heavens of the equinoctial line indicates a motion of the axis of rotation of the earth, such that it describes circles round the poles of the ecliptic in 25,791 years. Nutation (L. *nutatio*, a nodding) is a similar, but much smaller gyratory motion of the earth's axis, whose period is about nineteen years. From these two causes in combination the axis follows a sinuous path, instead of a circle, about the pole of the ecliptic. Nutation causes the equinoctial points to be alternately in advance of and behind their mean place due to precession by 6.87″. At present the vernal equinoctial point is in the zodiacal sign Pisces, and it is moving towards the sign Aquarius.

Precious Metals, a name commonly applied to gold and silver in contradistinction to such ordinary and abundant metals as iron, copper, lead.

Precious Stones. See *Gems.*

Precipitate (pre-sip'i-tāt), in chemistry, a solid body produced by the mutual action of two or more liquids mixed together, one or other of them holding some substance in solu-

tion. The term is generally applied when the solid appears in a flocculent or pulverulent form. Substances that settle or sink to the bottom like earthly matters in water are called sediments, the operating cause being mechanical, not chemical. Red oxide or peroxide of mercury is often called *red precipitate.*

Precognition (prē-kog-nish'un), in Scotch law, the examination of a witness at some time previous to his appearance in court. Precognitions may be taken in civil or criminal cases, and may be taken by the agents or counsel for any of the parties. In criminal trials the precognitions for the crown are generally taken by the procurator-fiscal and the signature of the witness is affixed; but those acting for the defense may take precognition from the crown witnesses also if they please. Precognitions are rarely taken in presence of a magistrate, or on oath.

Predestination (prē-des-ti-nā'shun), in theology, the term used to denote the decree of God, whereby the elect are foreordained to salvation. The theory of predestination represents God's absolute will as determining the eternal destiny of man, not according to the foreknown character of those whose fate is so determined, but according to God's own choice. This doctrine has been the occasion of many disputes and controversies in the church in all ages. On the one side, it has been observed that the doctrine of predestination destroys moral distinction, introduces fatalism, and renders all our efforts useless. On the other side, it is contended that if God's knowledge is infinite he must have known everything from eternity; and that the permission of evil under such circumstances is indistinguishable from a plan or decree under which it is foreordained. The first great champions of these opposite views were Pelagius and Augustine. The former held that there was a possibility of good in man's nature, and that the choice of salvation lay in man's will. Augustine maintained that apart from divine grace there is no possibility of good in human nature, and that since the fall man's will has no power of choice. Predestination forms one of the peculiar characteristics of the Calvinistic theology; the question is left an open one by the Anglican Church, and also by the Roman Catholic Church since the Reformation.

Predicables (pred'i-ka-blz), in logic, are terms affirmable, as predicates, of other terms. The predicables are said to be five: genus, species, difference, property, and accident. The first two name the higher and lower classes of the things classified: a genus includes more than one species. The other three express the attributes on which the classification is founded.

Predicament. See *Category.*

Predicate, in logic, what is affirmed or denied of the subject.

Preëxistence, Doctrine of, the doctrine sometimes maintained that the soul of every man has an existence previous to that of his body. This opinion has for ages been prevalent in Hindustan, and was held by several Greek philosophers, more especially by the Pythagoreans, Empedocles, and also apparently by Plato. A similar doctrine has found some countenance in Christian times as an explanation of the union of soul and body. In favor of this theory appeal is made to these peculiar sensations which are sometimes raised by sights or sounds, which we feel conscious of having had a former familiarity with, though reason would persuade us we had seen them for the first time. The doctrine is supported by some modern German philosophers, particularly the younger Fichte, and is maintained by the modern Theosophical Society, which now has a considerable membership in Europe and the United States.

Préfet (prā-fā; L. *præfectus*), the title of an important political functionary in France, whose office was created in 1800 at the instance of Napoleon. There is a préfet at the head of each department, who is entrusted with the whole organization and management of the police establishments; but not with the punishment of police offenses. Within this sphere of action the préfets are unchecked; the sous-préfets, who are appointed by them, and who stand at the head of the districts, are entirely subject to their commands; and the authorities of the communes, as well as the justices of the peace, can set no limits to their activity. In time of tumult they can call out the military, or provisionally declare a state of siege. The council of the préfecture is a court in which are settled all disputes respecting the taxation of individuals, engagements with the state for building, the indemnification of those who have had to give up anything to the public, etc. Of this court the préfet is president, and in it he has a casting vote. The appeals against its decisions lie to the council of state.

Pregnancy (preg'nan-si), the state of a female who is with

child. It lasts in the human subject from 274 to 280 days; that is to say, that time should elapse from the moment of conception to the time of birth. Among the earliest signs of pregnancy are the stoppage of the monthly discharge, and sickness, usually felt in the early part of the day, and thus called 'morning sickness.' The latter usually begins about the fourth or fifth week, and may last all the time, but often diminishes in course of the fourth month. Changes in the breast are evident during the second month, the nipple becoming more prominent, and the dark circle round it being deeper in tint by the ninth week, little elevated points in it being more marked. Towards the fourth month enlargement of the belly becomes noticeable, and continues to increase regularly till delivery takes place. About the sixteenth or seventeenth week quickening occurs; that is, the mother becomes aware of movements of the child. None of these signs are, however, absolutely conclusive, as various conditions may give rise to similar signs or signs resembling them. The only conclusive evidence is the detection of the sounds of the child's heart, heard by applying the ear to the belly of the mother, midway between the navel and the line of the groins, a little to the right or left of the middle line. They may be detected about the eighteenth week. During pregnancy women should take regular meals of plain, nourishing food, avoiding rich and highly-seasoned dishes, and should restrain unwholesome cravings, which sometimes exist. Gentle but regular and moderate exercise should be engaged in, all undue exertion, effort, and fatigue being avoided. Clothing should be warm, woolen next the skin, and *nowhere tight*. Prudence in baths must be exercised, too hot or too cold water being avoided, and the bowels must be kept well regulated, only the mildest medicine being used. Above all, a calm and equable frame of mind should be cultivated, and there should be no hesitation in asking advice of the doctor.

Prejevalski. See *Przhevalski.*

Prelate (prel'at), in church law, one of those spiritual dignitaries who exercise jurisdiction in their own name. These were originally only the bishops, archbishops, patriarchs, and the pope. The cardinals and legates, abbots and priors, also obtained certain privileges of jurisdiction by grant or prescription. The term is now commonly used merely to signify one of the higher dignitaries of the church.

Prelude (prel'ūd), in music, originally the first part of a sonata; though, as the name implies, it may be an introduction to any piece of music. Bach and his contemporaries elaborated preludes considerably; and Chopin wrote several piano works which, though complete in themselves, he designated preludes. More recently the term has been applied to operatic introductions when they are shorter than the usual overture. Wagner in particular has prefaced most of his operas with a prelude.

Premises. See *Logic, Syllogism.*

Premonstratensians, or NORBERTINES, a religious order, founded at Prémontré, near Laon in France by St. Norbert in 1120, who gave them the rule of St. Augustine with some additional rigor. The order was introduced into England in 1146, and its members were there regularly known as the White Canons. Before the Reformation they had 2000 monasteries, among which were 500 nunneries, mostly in Germany, the Netherlands, France, England, and the north of Europe. The order is now very small.

Prentiss (pren'tis), SERGEANT S., orator, born in Portland, Maine, in 1808, removed to Mississippi in 1827. As a lawyer he was in the front rank; as a speaker was remarkable for wit, sarcasm, and argumentative power. His manner of speaking was at once natural and dramatic. He died in 1850.

Preposition (prep-u-zish'un; from L. *præpositus*, placed before), a part of speech which is used to show the relation of one object to another, and derives its name from its being usually placed before the word which expresses the object of the relation. In some languages this relation is often expressed merely by changes of the termination.

Presburg. See *Pressburg.*

Presbyopia (pres-bi-ō'pi-a), or PRES'BYOPY, that is, 'old-sightedness,' an affection of the eye common at an advanced stage of life; its effect is to render objects near the eye less distinct than those at a distance. Persons affected with presbyopia generally have to use convex spectacles.

Presbyter (prcs'bi-tėr; Gr. *presbyteros*, an elder), an office-bearer in the early Christian Church, the exact character and position of whom is differently regarded by different authorities. Presbyterians generally maintain

that originally *bishop* and *presbyter* were one and the same; Episcopalians generally maintain that from the first they were different, as was certainly the case in very early times. By the end of the second century the presbyters held a position in connection with the congregations intermediate between that of bishop and deacon, and represented the priests or second order of clergy.

Presbyterian (pres-bi-tē′ri-an), a name applied to those Christians who hold that there is no order in the church as established by Christ and his apostles superior to that of presbyters (see *Presbyter*), and who vest church government in presbyteries, or associations of ministers and elders, possessed all of equal powers, without any superiority among them. The Presbyterians believe that the authority of their ministers is derived from the Holy Ghost by the imposition of the hands of the presbytery; and they oppose the Independent scheme of the common rights of Christians by the same arguments which are used for that purpose by the Episcopalians. They affirm that all ministers, being ambassadors of Christ, are equal by their commission; and that Episcopacy was gradually established upon the primitive practice of making the moderator, or speaker of the presbytery, a permanent officer. These positions they maintain against the Episcopalians by the general argument that the terms bishop and presbyter are used as synonymous terms in the New Testament, and that they were used simply to designate the minister appointed by the apostles to take charge of a new church on its foundation. They therefore claim validity for the ordination after the Presbyterian form, as there was originally no higher ecclesiastic than a presbyter in the church.

The first Presbyterian church in modern times was founded in Geneva by John Calvin about 1541; and the constitution and doctrines were thence introduced, with some modifications, into Scotland by John Knox about 1560, though the Presbyterian was not legally recognized as the national form of church government until 1592. For nearly a century after this date there was a continual struggle in Scotland between Episcopacy and Presbyterianism; until ultimately by the Treaty of Union in 1707 it was agreed on the part of England and Scotland that that form of church government should be the national form of ecclesiastical government in Scotland, and that the Scotch Church should be supported as the only one established by law.— The constitution of the Scotch Church, and of the Presbyterian Church generally, is as follows: — The kirk-session is the lowest court, and is composed of the parochial minister, or ministers, if more than one, and of lay elders (usually from six to twenty); the minister, or senior minister where there are more than one, being president or moderator. This court exercises the religious discipline of the parish; but an appeal may be made from its decisions to the presbytery, and again from the presbytery to the synod. A presbytery consists of the pastors of the churches within a certain district, and of an elder connected with each, while the synod comprises the presbyteries within a certain area, their ministers and representative elders. (See *Presbytery, Synod.*) The General Assembly is the highest ecclesiastical court, its decisions being supreme. (See *Assembly, General.*) Besides the Established Church of Scotland there are others whose constitution is Presbyterian, but who decline being connected with or receiving emoluments from the state. The chief of these, the Free Church and the United Presbyterian, united in 1900 as the United Free Church of Scotland.

Shortly after the Reformation Presbyterianism was in considerable strength in England, a large number of the Puritans preferring this system to episcopacy; but it subsequently declined in strength. The rule of the Stuarts, however, did much to renew its vigor, and in 1642 the Long Parliament abolished episcopacy, a measure followed by the meeting of the famous Assembly of Divines at Westminster the following year. In 1646 presbytery was sanctioned by parliament, but it was never generally adopted, or regularly organized, except in London and Lancashire. Soon after the Restoration episcopacy was restored, and about 2000 Presbyterian clergy were ejected from their cures in consequence of the Act of Uniformity in 1662. Presbyterianism has ever since been simply one of the forms of dissent in England, and has held no prominent position, though many Presbyterian churches are scattered throughout England. Of these by far the greater number are united to form a single body, the Presbyterian Church of England.— The Presbyterian Church in Ireland originated through the settlement of Scottish colonists in Ulster in the reign of James I. When Charles II attempted to force Prelacy upon the Scotch many of them took refuge in the north of Ireland, which gave the cause of Presbyterianism in that country a

fresh impulse. The favor shown them by William III was of great assistance to them; which they repaid by the part they played in the rebellion under James II, particularly in the memorable siege of Londonderry.

Presbyterianism was early introduced into the United States. Various bodies are the Presbyterian Church in the U. S. A., Presbyterian Church in the U. S. (South), Cumberland Presbyterian Church, United Presbyterian Church of North America, Cumberland (Colored) Presbyterian Church, Associate Reformed Presbyterian Church, Synod of Reformed Presbyterian Church of N. A., General Synod of Reformed Presbyterian Church in N. A., and Associate Synod of N. A. Total membership in United States, 2,500,000. Estimated Presbyterian population, 6,726,698.

Presbytery (pres'bi-ter-i), a judicatory, consisting of the pastors of all the churches of any particular Presbyterian denomination within a given district, along with their ruling (*i.e.*, presiding) elders, there being one ruling elder from each church session commissioned to represent the congregation in conjunction with the minister. The functions of the presbytery are, to grant licenses to preach the gospel, and to judge of the qualifications of such as apply for them; to ordain ministers to vacant charges; to judge in cases of reference for advice, and in complaints and appeals which come from the church sessions within the bounds of the presbytery; and generally to superintend whatever relates to the spiritual interests of the several congregations under its charge, both in respect of doctrine and discipline. Appeals may be taken from the presbytery to the provincial synod, and thence to the general assembly.

Prescot (pres'kut), a manufacturing and market town in England, county of Lancaster, 8 miles east of Liverpool. Prescot has long been noted for the manufacture of watch-tools, watch-movements and hands, small files, etc. Earthenware, glass bottles, etc., are also manufactured. Pop. (1911), 8154.

Prescott, William Hickling, historian, born in Salem, Massachusetts, in 1796; died in 1859. His father was a lawyer, the son of Colonel William Prescott, who commanded the American forces at the battle of Bunker Hill. In 1811 he entered Harvard College, and was graduated in 1814. While at college he met with an accident to his left eye, completely depriving him of its use for ever afterwards, and rendering the other eventually so weak that during the latter half of his life he could scarcely use it. After two years spent in traveling through England, France, and Italy, chiefly for health, he returned to his native country, where he married, and set himself assiducusly to literary labor. The earliest fruits of this were contributions to the *North American Review;* and for many years his only productions were essays and magazine articles. Acquaintance with Spanish literature, which he began to cultivate in 1824, led him to attempt his first great work on Spanish history, *The Reign of Ferdinand and Isabella*, published in 1837. It was received with enthusiasm both in America and Europe; was rapidly translated into French, Spanish, and German; and its author was elected a member of the Royal Academy at Madrid. Prescott's next work was the *History of the Conquest of Mexico, with a Preliminary View of the Ancient Mexican Civilization, and the Life of the Conqueror Hernando Cortez*, which appeared in 1843, and was received with an equal degree of favor. In 1847 he published the *History of the Conquest of Peru, with a Preliminary View of the Civilization of the Incas.* In 1855 the first two volumes of the long-expected *History of the Reign of Philip II, King of Spain*, appeared, and proved to the public equally acceptable with Prescott's former works. In 1858 was published a third volume; but the sudden death of the author from apoplexy put a stop to his labors. Prescott affords a remarkable instance of the success of indomitable industry and perseverance, carried out in spite of the affliction of partial blindness.

Prescott, county seat of Yavapai Co., Arizona, 134 miles N. of Phœnix. It is an important mining, cattle, farming and commercial center for Northern Arizona. Location of Whipple Barracks, U. S. government hospital. Pop. (1920) 5010.

Prescription (pre-skrip'shun), in law, is a right or title acquired by use and time; the object being to secure the title to property to him who has had the possession of it for the term fixed by the law, and to prevent any one from disturbing his possession after such term has expired. In the English common law the term *prescription* is applied only to incorporeal hereditaments, as a right of way, a common, etc., and requires immemorial time to establish it. This rule was modified, however, by a statute under William IV, which provides that no right of common shall be defeated after thirty years'

enjoyment, and after sixty years the right is deemed absolute and indefeasible, unless had by consent or agreement. In claims of right of way, of water-course, and similar easements the periods are twenty and forty years. Claims to the use of light to any dwelling-house or building enjoyed for twenty years are indefeasible, unless shown to have been by consent.

By the law of Scotland prescription has a much wider operation than by the law of England. It not only protects individuals from actions which other parties might have brought against them, but in some instances creates a positive title to property. The prescription by which a right of property can be established is that of forty years. Whatever adverse right is not cut off by the other special prescriptions of shorter periods is destroyed by the long prescription, as this is called. To create a title to real property, the long prescription must be both positive and negative. The party holding the property must have been forty years in unchallenged possession, and be able to show a *prima facie* valid title; while a claimant must have been forty years without an ostensible title, and must, by not legally challenging it, have tacitly acquiesced in the possessor's title. By Scotch law, but not by English, a vicennial prescription applies to crimes, no prosecution being competent after a period of twenty years. In American practice prescription presupposes a lost grant, and can therefore give a title to those things only which can pass by grant. In almost all the States of the American Union there are express statute provisions regulating the doctrine of prescription. Generally an uninterrupted possession of twenty years is required for the acquisition of real rights. In some States a notification by the owner of the land to the occupant that his intention is to contest the title may defeat prescriptive acquisition.

Prescription, in medicine, is the form, with directions, in which a medicine or medicines are ordered or prescribed by a medical man. The several medical substances which may be contained in a prescription are distinguished by names indicative of the office performed by each. These are — 1. The *basis*, which is the principal or most active ingredient. 2. The *adjuvant*, or that which is intended to promote the action of the basis. 3. The *corrective*, intended to modify its action. 4. The *excipient*, or that which gives the whole a commodious or agreeable form. To these certain writers add a fifth, the *intermedium*, which is the substance employed to unite remedies which do not mix with each other or with the excipient, such as yolk of eggs and mucilage, employed in the preparation of emulsions. In choosing the form of a prescription it should be borne in mind that solutions and emulsions generally act with more certainty and rapidity than powders diffused through water; and these again than the semisolid and solid forms of medicine. See also *Pharmacy*.

Presentation (prez-en-tā'shun), the nomination of one or several candidates to a vacant office; commonly used in the case of a patron to a church. In England the clergyman is presented to the bishop to be instituted in a benefice; in Scotland, before the abolition of church patronage, he was presented to the presbytery for induction.

Presentment (pre-zent'ment), in law, is, properly speaking, the notice taken by a grand jury of any offense, from their own knowledge or observation, without any bill of indictment being laid before them at the suit of government.

Preserved Provisions, PRESERVES. The preservation of dead organic matter from the natural process of decay is a most useful means of increasing and diffusing the food supply of the world. Animals, vegetables, and fruits may all be easily preserved for this purpose. The preserving of fruits is an old and familiar process. This is generally effected by boiling or stewing, though drying is also frequently resorted to, where the fruit is meant to be kept intact. Fruits intended for confectionery are preserved in four different ways — 1. In the form of jam, in which the fruit is boiled with from three-fourths to about equal its weight of sugar. 2. In the form of jelly, in which the juice only is preserved, by being carefully strained from the solid portions of the fruit, and boiled with about half of its weight of sugar. 3. By candying, which consists in taking the fruits whole or in pieces, and boiling them in a clear syrup of sugar previously prepared. They absorb the syrup, which is then crystallized by the action of a gentle heat. 4. By stewing them in a syrup of sugar and water till they become soft but not broken, and transferring them with the syrup to jars. Many add pale brandy equal in quantity to the syrup. Several kinds of vegetables, as cabbages, cucumbers, cauliflowers, onions, are preserved by pickling. (See *Pickles*.) Antiseptics are used to preserve meat also,

salting being the most common process. But to preserve large quantities of vegetable and animal products for food purposes, and at the same time to keep them nearly in their fresh state, they must be subjected to one of three processes. These are — drying, refrigeration, and exclusion of air and microbic germs. With vegetables, which contain so large an amount of water in proportion to their solid and nutritious material, the process of drying is peculiarly applicable, and it is largely employed as the means of furnishing fresh vegetable food for ships in a compact and portable form, when, in addition to desiccation, compression is also employed.

The preservation of articles of food by the application of cold is the simplest of all known methods, and in such climates as the United States, Russia, etc., it is largely taken advantage of; while of late it has generated a large and increasing trade between the countries of the north and south temperate zones. In 1875 ice began to be used to preserve fresh meat in considerable quantities, which was sent from America to Europe. The use of ice has been largely replaced by refrigerating machines, by which a temperature best suited to the preservation of the material is maintained. The result is that the distribution of meat over the surface of the globe is being revolutionized. The trade between Great Britain and New Zealand in fresh mutton is now immense, and a large trade exists between Argentina and northern countries. The modern methods of refrigeration for carrying purposes consist of an air-tight room on board ship, where the meat is kept, and through which dry cold air is made to circulate by means of special machinery driven by steam, the air being first compressed and cooled by the refrigerating machines spoken of, a further cooling taking place when it is again allowed to expand.

The process of preservation by exclusion from the action of atmospheric air is yearly assuming more importance and being more largely practiced. The most perfect method, and that which is now most generally resorted to, is the enclosure of the food in air-tight cases from which the air is then expelled; upon the perfection of the air-excluding process depends entirely the preservation of the article. The first successful attempt to preserve fresh meat in this way was made in 1809 by M. Appert, a Frenchman. The plan now generally adopted is commonly known as *canning*, and is applicable alike for flesh-meats, vegetables and fruits. The cans in which the food is packed are made of rolled steel sheet, coated by dipping the sheet in molten tin. At first all cans were made by hand, but are now made by automatic machinery. In the early method of canning the lids were perforated with a small aperture or pinhole and soldered carefully down. The cases were then set in a bath of chloride of calcium; heat was applied until the boiling point was reached and the air was thus expelled through the pinholes. These holes were then hermetically closed and the can and contents once more subjected to the operations of heat until the contents were perfectly cooked. The solder can has been superseded by the open-top or so-called sanitary can. One end is left entirely off until the can is filled. From the packing table the can is conveyed to the exhaust box, passing through steam which heats the contents to 160 degrees Fahrenheit. Then the entire end is crimped to the can by rollers, making it airtight. It is then cooked by steam and water to a temperature of 212 degrees Fahrenheit, and from the cooker it is taken to the storage room, piled and left to cool. If, after several days, swells, which are due either to defective sterilization or to leaky cans, develop, they are rejected.

No preservatives are needed under the present system of canning. Aside from the product itself the only things added are salt, sugar or other seasoning, and water. In the canning of corn and peas saccharin and sulphites were formerly used, but the practice has been discontinued. Canned foods are very wholesome, but once the can is opened they should be removed and used at once. Bacteria may develop if the canned provisions are permitted to stand open before being used. Glass bottles are largely used in place of tin cans for household preserving. Fruits may be preserved by pouring hot syrup into the jars and setting them, when closed, in boiling water.

President (prez'i-dent), one who presides; a presiding officer. The supreme executive officer of the United States is styled *President*. The qualifications of a person raised to this dignity are, to be a natural-born citizen of the age of 35 years, and to have resided 14 years within the States. The election is by an electoral college, the members of which are elected by popular vote, and who subsequently meet and elect the President. In his legislative capacity the President has the power of approving bills sent to him after passing Congress, or of returning them to the house in which they originated, with his reasons for non-approval

If he retains a bill for ten days without signing it becomes a law, unless an adjournment of Congress prevents its return, when it fails to become a law. In his executive capacity he is commander-in-chief of the army and navy; he has the power of making treaties, subject to the concurrence of two-thirds of the Senators; of appointing ambassadors, ministers, consuls, judges of the Supreme Court, and other public officials not otherwise provided for; of convening Congress in extra session when deemed necessary, and performing other executive duties. The *salary* of the President since 1909 has been $75,000, with $25,000 for traveling expenses. See also *United States, Constitution,* and *Succession, President.*

Presque Isle (presk īl), a town of Aroostook Co., Maine, 42 miles N. by W. of Houlton, on Bangor & Aroostook and Canadian Pacific railways. Pop. (1920) 5581.

Press, LIBERTY OF THE, the liberty of every citizen to print whatever he chooses, a privilege which does not prevent his being amenable to justice for the abuse of this liberty. The right of printing rests on the same abstract grounds as the right of speech, and it might seem strange to a man unacquainted with history that printing should be subjected to a previous censorship, as it is in some countries, and has been in all, any more than speaking, and that the liberty of the press should be expressly provided for in the constitutions of most free states. But when we look to history we find the origin of this, as of many other legislative anomalies, in periods when politics, religion, and individual rights were confusedly intermingled. It is only since men's views of the just limits of government have become clearer that the liberty of the press has been recognized as a right; and to England we are particularly indebted for the establishment of this principle. The existence of a censorship of the press was for centuries, however, deemed an essential to the safety of all European governments. Liberty of printing, as we understand it, is a comparatively modern notion; Milton's plea for a free press met with no response from his own party, nor for very many years later was it the cue of any party in the English commonwealth to refrain from suppressing the writings of their political opponents. In England the liberty of the press, soon after printing was introduced, was regulated by the king's proclamations, prohibitions, charters of license, etc., and finally by the court of Star-chamber. The Long Parliament, after their rupture with Charles I, assumed the same power. The government of Charles II imitated their ordinances, and the press did not really become free till the expiration of the statutes restricting it in 1693, after which it was found impossible to pass new laws in restraint of it, and it has remained free ever since, the last restriction in England ceasing with the abolition of the newspaper stamp duty, in 1856. Such legal checks as remain are merely intended to prevent outrages on religion or decency, to protect subjects from defamation, and to conserve the copyright of authors. The constitutions of many of the United States declare, as we should expect, for liberty of the press, and one of the notable events of colonial history was a suit in New York which established liberty of the press in that colony. Within the United States as a nation there has been no question of the full liberty of the press, subject to the operation of the law for libel. The same may be said of all the South American republics. Among European countries, it may be generally said the liberty of the press is found most predominant among the weaker powers, such as Spain, Turkey, Sweden and Norway, Switzerland, and Roumania; while in Germany, Austria, and particularly in Russia, there are still many restrictions. In the British colonies the law is as in England, but in India the governor-general exercises a censorship. See *Books* (*Censorship of*).

Press, PRINTING. See *Printing.*

Pressburg, or PRESBURG (pres'burg), a town in Hungary, 35 miles east of Vienna, beautifully situated on the left bank of the Danube, and on spurs of the Little Carpathians. The most striking edifice is the ruined royal palace, on the top of an eminence, burned in 1811. The cathedral is a large Gothic structure, dating from the eleventh century, which has latterly been considerably modernized; here the kings of Hungary were crowned. The Franciscan church (thirteenth century) is also noteworthy. There are also several palaces, including that of the primate of Hungary. The river is here crossed by a bridge of boats. The manufactures are various. The trade, particularly transit, and chiefly in corn and timber, is extensive. Pressburg is a place of very great antiquity, and was long a fortress of some strength. In 1541, when the Turks captured Buda, it became the capital of Hungary, and retained the honor till the Emperor Joseph II restored it to Buda. The treaty by which Austria ceded Venice to France and the Tyrol to Bavaria wa

signed here in 1805. Pop. 78,223, more than half of whom are Germans and several thousand Jews.

Pressensé (prā-sȧn-sā), Edmond de, a French Protestant minister, born at Paris in 1824. After studying under Vinet at Lausanne, and at Halle and Berlin, he became pastor of Taitbout Chapel, Paris, where he gained a high reputation as a preacher. He sat in the National Assembly (1871-75), and was made life senator in 1883. He is the author of many religious works — historical, evangelical, etc., some of which, including his *Life of Christ*, have been translated into English. He died in 1891.

Press-gang, the name given in England to a detachment of seamen who (under a naval officer) were empowered, in time of war, to lay hold of seafaring men and compel them to serve in the king's ships. This practice became obsolete during the last century, though the laws permitting it have never been repealed. No such practice has ever existed in the United States.

Prester John (Priest or Presbyter John), a legendary personage of some note. In the middle ages it was reported by travelers that there was a Christian prince who reigned in the interior of Asia under this name, and the same story was also known to the Crusaders. Who this Prester John was it is not easy to decide; the supposition that he was the Dalai Lama, or one of the chief priests of the Lamaites, does not agree with the position assigned to his residence by travelers. The Portuguese in the fifteenth century picked up a story of a Christian prince in Central Africa, and by some confusion of names they transferred thither the throne of Prester John. Hence in recent times the home of this mythical prince and priest has always been laid in Abyssinia.

Presto (pres'tō; Italian), quick, used in music to designate a faster rate of movement than is indicated by *allegro*. *Presto assai* denotes very quick, and *prestissimo* the highest degree of quickness.

Preston (pres'tun), a municipal and parliamentary borough of England, in Lancashire, 27 miles northeast of Liverpool, agreeably situated on a height above the right or north bank of the Ribble, near the head of its estuary. The environs of the town exhibit much pleasing scenery, and the town possesses three fine public parks. Among the churches Christ Church is admired for the purity of its Norman architecture; the parish church, which has been rebuilt in the decorated style of the fourteenth century, is also a fine building; and one of the Roman Catholic churches, St. Walburga's, is considered the finest in the town. The town-hall is a splendid structure; and generally the architecture of Preston is good. The river is spanned by five bridges, two of them railway bridges, one of which cost £40,000. The railway station (recently reconstructed) is very large, and is one of the most important junctions on the London and Northwestern Railway. The original staple manufacture of the town was linen, which is still woven to some extent, but has been completely eclipsed by the cotton manufacture, of which Preston is now one of the chief centers. Preston also has machine-shops, iron and brass foundries, railway-carriage works, breweries, malthouses, roperies, tanneries, etc. Some shipping trade is carried on, and extensive harbor and river diversion works have much improved the town as a port. In 1323 Preston, originally Priest's-town, was taken and burned by Robert Bruce; in the great civil war it espoused the royalist cause, and was twice captured by the Parliamentarians; in the rebellion of 1715 it was occupied by the Jacobite forces; in that of 1745 the Highlanders, headed by the Pretender, passed through Preston both on their march to London and on their retreat. Preston was the birthplace of Arkwright. Pop. (1911), 117,088; (1921) 117,426.

Prestonpans (pres-tun-panz'), a small town in Scotland, in the county of Haddington, near the south shore of the Firth of Forth. It used to have a flourishing manufacture of salt: hence the name. In the vicinity is the scene of the famous battle in 1745, when the Jacobites defeated Sir John Cope and the royal forces.

Prestwich (prest'wich), a town of England, in Lancashire, 4 miles northwest of Manchester, a favorite residence of Manchester merchants. Pop. (1911) 17,195; (1921) 18,750.

Presumption (pre-zum'shun), in law, is the assuming of a fact or proposition as true, and is of two kinds, *præsumptio juris* and *præsumptio juris et de jure*. The *præsumptio juris* is a presumption established in law till the contrary be proved, *e. g.* the possessor of goods is presumed to be the owner. The *præsumptio juris et de jure* is that where law or custom establishes any proposition that cannot be overcome by contrary evidence, as the incapacity in a minor with guardians to act without their consent.

Pretender. See *Charles Edward Stuart*, and *Stuart (James Edward Francis)*.

Pretoria (prē-tō′ri-a), a city of South Africa, capital of the Transvaal Province and of the Union of South Africa, 35 miles N. E. of Johannesburg. It was founded in 1855; named after the Boer general, Pretorius, first president of the South African Republic. Captured by the British in 1900. Pop. 50,000.

Prevention of Cruelty to Animals. See *Animals (Cruelty to)*.

Prevesa (pre′vā-zä), a fortified seaport of Greece, in the Epirus, Department of Janina, at the entrance to the Gulf of Arta. Formerly in Albania, it was annexed to Greece as a result of the Balkan wars (1912-13). It has had a stormy history, having been frequently blockaded and captured. Turkey long had possession of the town. Pop. 7000.

Prévost D'Exiles (prā-vō deg-zēl), Antoine François, a French writer, born in 1697. Originally a member of the Jesuit order, he soon quitted it for the military service. After alternating several times between the church and the army, he gave up both professions, and in 1729 he went to Holland, where he published his *Mémoires d'un Homme de Qualité*. After a sojourn of two years in England he returned to France, and was appointed almoner and secretary to the Prince of Conti. From this period till his death in 1763 he pursued an active literary life, editing a journal called *Pour et Contre*, and publishing many romances, of which the best known are the *Histoire de M. Cleveland*, and the *Histoire du Chevalier des Grieux et de Manon Lescaut*.

Prévost-Paradol (prā-vō-på-rå-dol), Lucien Anatole, a French writer and member of the Academy, was born at Paris in 1829. In 1855 he obtained the chair of French literature in the faculty of Aix, but soon resigned, and next year became one of the editors of the *Journal des Débats*, a paper with which he never broke his connection. In 1870 he went as ambassador to the United States; but soon after his arrival put an end to his own life — his mind being, it is believed, unhinged by the news of the declaration of war by France against Prussia. He wrote *Études sur les Moralistes Français*, *Essai de l'Histoire Universelle*, *La France Nouvelle*, *Du Rôle de la Famille dans l'Éducation*, etc.

Priam (prī′am), in Greek legend, the last king of Troy, the son of Laomedon. By his second wife, Hecuba, he had, according to Homer, nineteen children, the most famous being Hector, Paris, Cassandra, and Troilus. His name has been rendered famous by the tragical fate of himself and his family, as a result of the Trojan war. When he was extremely old the Greeks demanded of him the restoration of Helen, who had been carried away by Paris, and on his refusal to give her up they made war against Troy, and took and destroyed the city, after a siege of ten years. Homer gives no account of the death of Priam; but other poets represent him to have been slain at the altar of Zeus by Pyrrhus the Greek.

Priapus (prī-ā′pus), a Greek deity, the deformed son of Dionysus and Aphrodite, a god of gardens, fruits, etc., considered by mythologists to represent fertility in nature. He was worshiped in all parts of Greece, and also in Rome.

Pribram (prē′bråm; *Boh*, prshē′-bråm), a town of Central Bohemia, in a district where are rich lead and silver mines. Pop. 13,576.

Pribylov Islands (prē′be-lof), or Pri′yloff, a group of islands on the coast of Alaska, in Behring Sea, belonging to the United States. The largest are St. Paul, St. George, Walrus and Beaver Islands. They are frequented by numbers of fur-seals. The natives are Aleutians.

Price. Same as *Value*. See *Political Economy*.

Price (prīs), Richard, an English religious and economical writer, born in 1723; for most of his life a pastor to various Dissenting churches in the metropolis. He commenced his literary career in 1758 by his *Review of the Principal Difficulties in Morals*, which was followed by *Four Dissertations on the Importance of Christianity*, *The Nature of Historical Evidence*, etc., (1767). In 1771 appeared his *Observations on Reversionary Payments and Annuities*, and later the celebrated *Northampton Mortality Tables*. He also published a number of political tracts, in one of which he advocated the cause of the American colonies in 1776. When Pitt became prime-minister he consulted Dr. Price in his schemes for the reduction of the national debt, and the establishment of the sinking fund was the result of his recommendation. At the commencement of the French revolution, in a sermon (published in 1789) *On the Love of Country*, he warmly expressed his delight at the emancipation of the French people. This discourse produced Burke's *Reflections*,

in which Dr. Price was severely treated. He died in London in 1791.

Prichard (pritch'ard), JAMES COWLES, ethnologist, born at Ross, in Herefordshire, in 1785; died at London in 1848. He studied medicine, and took the degree of M.D. at Edinburgh; commenced practice as a medical man at Bristol, and in 1810 received the appointment of physician to the Clifton Dispensary and St. Peter's Hospital. In 1813 he published his great work, *Researches into the Physical History of Mankind*, and in 1843 appeared his *Natural History of Man*. He wrote many minor works on ethnology, besides treatises on various medical subjects. In 1845 he left Bristol for London, where he died.

Prickly Ash, a name given to several prickly shrubs of the United States, genus *Xanthoxylum*, order Rutaceæ. They have an aromatic and pungent bark, which from being used as a remedy for toothache gains them the name of *toothache-tree*.

Prickly Heat, the popular name of an eruptive skin disease occurring in hot weather or in hot climates. It is characterized by the elevation of the papules of the skin and intense itching. While annoying, it is not in the least dangerous. One familiar variety of it is known as *Lichen tropicus*. See *Lichen*.

Prickly Pear, *Opuntia vulgāris*, nat. order Cactaceæ, otherwise called Indian fig. The opuntia is a fleshy and succulent plant, destitute of leaves, covered with clusters of spines, and consisting of flattened joints inserted upon each other. The fruit is purplish in color, covered with fine prickles, and edible. The flower is large and yellow. It is a native of the tropical parts of America, whence it has been introduced into Europe, Mauritius, Arabia, Syria, and China. It is easily propagated, and in some countries is used as a hedge-plant. It attains a height of 7 or 8 feet.

Prickly Pear (*Opuntia vulgaris*).

Prideaux (pri'dō), HUMPHREY, an English divine, born at Padstow, Cornwall, in 1648. He was successively prebendary of Norwich, rector of Bladen, rector of Soham, archdeacon of Suffolk, vicar of Trowse, and dean of Norwich. His chief works were *The Old and New Testaments Connected in the History of the Jews and Neighboring Nations*, and a *Life of Mohammed*. He died in 1724.

Pride of India. See *Melia*.

Priest (prēst; Hebrew, *kôhên;* Greek, *hiereus;* Latin, *sacerdos*), in its most general signification, a man whose function is to inculcate and expound religious dogmas, to perform religious rites, and to act as a mediator between worshipers and whatever being they worship. In some countries the priesthood has formed a special order or caste, the office being hereditary; in other countries it has been elective. In sacred history the patriarchal order furnishes an example of the family priesthood. Abraham, Isaac, and Jacob perform priestly acts, and 'draw near to the Lord,' as also does Job, and the Arab sheikh to this hour unites in his person the civil and religious headship. The Mosaic priesthood was the inheritance of the sons of Aaron, of the tribe of Levi. The order of the priests stood between the high-priest on the one hand and the Levites on the other. (See *High-priest* and *Levites*.) The ceremony of their consecration is described in Exodus xxiv and Leviticus viii. They wore a special dress, and their actions were in many cases prescribed strictly by the Mosaic law. Their chief duties were to watch over the fire on the altar of burnt offerings, and to keep it burning continually; to offer a lamb morning and evening, and two lambs on the Sabbath, each accompanied with a meat-offering and a drink-offering at the door of the tabernacle. These were fixed duties which never varied, but their chief function was their being always at their post to do the priest's office for any guilty, penitent, rejoicing, or thankful Israelite. As their functions necessarily took up the greater part of their time, a distinct provision had to be made for them by tithes, a share of spoil taken in war, of the offerings, etc. On the settlement of the Jews in Canaan the priestly order had thirteen cities allotted to them, with pastures for their flocks. In the time of David the priestly order was divided into twenty-four courses, each of which was to serve in rotation for one week, while the further assignment of special services during the week was determined by lot. The division thus instituted was confirmed by Solomon, and continued to be recognized as the typical number of the priesthood. In the New Testament believers generally are regarded

as having the character of priests, and it is held by many Protestants that the idea of a consecrated priesthood invested with sacrificial functions is repugnant to Christianity. In some churches, therefore, the name priest is not used, minister, pastor, etc., being the term employed instead. Those Christians, however, who, like the Roman Catholics, Greeks, etc., look upon the eucharist as a sacrifice, regard the priest as performing sacrificial duties, and as standing in a special relation between God and his fellow-man. The priests of the Church of Rome are bound to a life of celibacy; but in the Greek Church a married man may be consecrated a priest. In the Anglican and other Episcopal churches the priests form the second order of clergy, bishops ranking first. Diverse views of the priestly office are held in the Anglican and allied churches.

Priestley (prēst'li), JOSEPH, an English scientist and divine, was born in 1733 near Leeds. His father was a clothier, of the Calvinistic persuasion, in which he was also himself brought up. At the age of nineteen he was placed at the Dissenting academy at Daventry, with a view to the ministry, where he spent three years. He there became acquainted

Joseph Priestley.

with the writings of Dr. Hartley, which made a great impression upon his mind; and he was gradually led into a partiality for Arianism. On quitting the academy in 1755 he accepted an invitation to become minister at Needham Market, in Suffolk, where he had to live as best he could on an average salary of £30 a year. His views did not, however, prove palatable to his congregation, who mostly deserted him, and in 1758 he undertook the charge of a congregation at Nantwich, in Cheshire, to which he joined a school. About this time he published his first work, *The Scripture Doctrine of Remission*. In this he rejected the doctrines of the Trinity and the Atonement. In 1761 he became a teacher in the Dissenting academy at Warrington, and while here wrote a *History of Electricity*, which gained him admission to the Royal Society, and the degree of LL.D. from the University of Edinburgh. In 1767 he became minister of the Mill Hill chapel at Leeds, where his religious opinions became decidedly Socinian. While here he published his *History and Present State of Discoveries relating to Vision, Light, and Colors* (1772), his next important work being *Institutes of Natural and Revealed Religion* (1772-74). After a residence of six years at Leeds he accepted an invitation from the Earl of Shelburne, afterwards Marquis of Lansdowne, to reside with him as a companion in the nominal capacity of librarian, with a salary of £250, an appointment which gave him ample opportunities for prosecuting scientific research. In 1774 he discovered oxygen, or 'dephlogisticated air,' as he called it, a result which was quickly followed by other important discoveries in chemistry. Among his works belonging to this period are *Experiments and Observations on Different Kinds of Air; An Examination of Dr. Reid's Inquiry into the Human Mind; Hartley's Theory of the Human Mind; The Doctrine of Philosophical Necessity;* etc. Some of his philosophical works brought about differences between himself and his patron, and the connection was dissolved in 1780, Priestley retaining an annuity of £150 per annum. He next removed to Birmingham, where he became once more minister of a Dissenting congregation, and wrote *History of the Corruptions of Christianity; History of Early Opinions concerning Jesus Christ; General History of the Christian Church;* etc. Owing to his favorable opinions regarding the French revolution a mob assembled and set fire to Dr. Priestley's house, and in the conflagration his apparatus and manuscripts were destroyed. For this insane outrage he received compensation, but according to his own estimate too little by £2000. On quitting Birmingham he became president of the Dissenting college at Hackney, but was goaded by party enmity to seek an asylum in the United States in 1794. He took up his residence at Northumberland, in Pennsylvania, where he died in 1804. He is regarded

as the founder of Unitarianism in the United States. As a man of science he stands high, while as a theologian, and especially as a historical theologian, he ranks low. As a metaphysician he holds a respectable position. But his great natural powers were so distributed in attacking subjects the most varied that he never attained such excellence in any one branch as his talents deserved.

Priluki (prē-lö'kē), a town of Russia, in the government of Poltava, on the Udai. Pop. 30,480.

Prim, JUAN, MARQUIS DE LOS CASTILLEJOS, COUNT DE REUSS, Field-marshal and Grandee of Spain, was born at Reuss, in Catalonia, in 1814. He was destined for the law, but on the outbreak of the civil war which followed the death of Ferdinand VII (September 29, 1833) he joined the volunteers who had taken up arms in the cause of the infant queen Isabella, and rose so rapidly that in 1837 he was appointed a colonel in the regular army. When Queen Maria Christina quitted Spain he allied himself politically with the Progresista party, and vigorously opposed Espartero, who had assumed the regency, May 8, 1841. During the next two years he was engaged in more than one insurrectionary movement. On the downfall of the Espartero ministry Prim was appointed by the queen a brigadier-general, and afterwards created Count de Reuss and governor of Madrid (1843). While in command of a division of reserves in the war against Morocco, 1860, he gained the brilliant victory of Los Castillejos, which secured for him the title of marquis. In 1861 he was appointed to command the Spanish contingent, which, along with others from England and France, was sent out to Mexico, but he withdrew along with the English. In January, 1866, he headed a revolt against the government of O'Donnell; but the insurrection was speedily suppressed, and he was compelled to flee. He succeeded in overthrowing Queen Isabella in 1868, after which he was appointed minister of war. He was shot by assassins in 1870.

Primary (prī'ma-ri), in geology a term used as equivalent to *palæozoic*, the name given to the oldest known group of stratified rocks, including the Cambrian, Silurian, Devonian, Carboniferous and Permian. See *Geology*.

Primary Election, a local meeting of the voters of a political party, at which the nominees, officials, or delegates of that party are chosen. The *direct primary* is a primary election at which the nominees of a party are chosen directly by the voters of that party, without the intervention of a nominating convention. The idea of the primary dates back to 1860 when the Republicans of Crawford Co., Pa., discarded the county convention of delegates and chose their county candidate by a direct election patterned after the general election. Other local groups from time to time followed a similar plan. Minnesota was the first state to adopt the policy. Other states followed, and by 1915 the direct primary had been adopted by nearly all the states. In 1910 Oregon provided for a presidential preference primary, and other states adopted the plan. In the *preferential primary* a voter expresses not only his or her first choice, but also a second and sometimes a third choice. The primary has been called 'a rich man's game', and the case is cited of the Michigan senatorial campaign in 1918, when $176,568 was spent to nominate Senator Newberry. The senate went on record that the 'expenditure of so much money was harmful to public morals, subversive of the dignity of the senate, and dangerous to the perpetuity of free institutions.' On the other hand, it is contended that under the convention system a great deal of money changed hands in connection with nominations, but it went not for printing, but directly into the pockets of the all-powerful political bosses.

Primary Schools, the same as elementary schools. See *Education*.

Primate (prī'mat), in the early Christian Church the title assumed by a bishop holding a position of pre-eminence. In Africa the title belonged to the bishop who had been longest ordained. At a later date 'primate' became the official title of certain metropolitans who obtained from the Pope a position of episcopal authority over several other metropolitans and who were at the same time appointed vicars of the Holy See. The title is still retained by the bishops of Armagh, Lyons, Mains, Toledo, Pisa, etc., though none of these possess any primatial jurisdiction. In the Church of England both the archbishops still retain the title of primate. the Archbishop of Canterbury being distinguished as the 'Primate of all England,' and the Archbishop of York as the 'Primate of England.'

Primates (prī-mā'tēz), the name given by Linnæus in his system of nomenclature to the first order of mammals. He placed this first, because he ranked man among the primates. The apes are included in the same order.

Primaticcio (prē-mā-tich'ō), FRANCESCO, an Italian

painter of the Bolognese school, born at Bologna in 1490. He received his first instruction from Innocenzo da Immola, and completed his studies under Giulio Romano. In connection with several of the pupils of the latter he painted the Palazzo del Tè, in Mantua, from Giulio's designs. Through the recommendation of Frederick, duke of Mantua, Primaticcio was taken into the service of Francis I of France in 1531. He did much to improve the palace at Fontainebleau, and gave a new impetus to French art. He made a collection of antique statues in Italy for Francis, and was appointed successor to Rosso as royal painter. He died in 1570.

Prime (prīm), in the Roman Catholic Church one of the canonical hours, and also the service in the breviary which falls to be performed at that time. The term is derived from the Latin *prima* (that is, *prima hora*, first hour), because prime begins with the first hour of the day according to the Eastern mode of reckoning, namely, 6 o'clock.

Prime Conductor, that part of an electric machine from which sparks are usually taken.

Prime Minister, or PREMIER. See *Ministers.*

Prime Number, a number which can be divided exactly by no number except itself and unity.

Priming (prīm'ing), in steam-engines, the entrance of water spray along with steam into the cylinder of an engine. It always causes great annoyance. The use of muddy water, insufficient steam-room, carelessly constructed flues and pipes, etc., in the boiler, give rise to priming. Superheating the steam is one remedy. Priming valves, a species of spring valves, fitted to the cylinder, are so adjusted as to eject priming by the action of the piston.

Primogeniture (prī-mō-jen'i-tūr), the right of the eldest son and those who derive through him to succeed to the property of the ancestor. The first-born in the patriarchal ages had among the Jews a superiority over his brethren, but the 'insolent prerogative of primogeniture,' as Gibbon denominates it, was especially an institution developed under feudalism. Before the Norman conquest the descent of lands in England was to all the sons alike, but later the right of succession by primogeniture came to prevail everywhere, except in Kent, where the ancient gavelkind tenure still remained. The right of primogeniture is entirely abolished in France and Belgium, but it prevails in some degree in most other countries in Europe. The rule operates only in cases of intestacy, and is as follows: — When a person dies intestate, leaving real estate, his eldest son is entitled by law to the whole. If the eldest son is dead, but has left an eldest son, the latter succeeds to the whole of the property. If the whole male line is exhausted then the daughters succeed — not in the same way, however, but jointly, except in the case of the crown, to which the eldest succeeds. In the United States no distinction of age or sex is made in the descent of estates to lineal descendants.

Primrose (prim'rōs; *Primŭla*), a genus of beautiful low Alpine plants, nat. order Primulaceæ. Some are among the earliest flowers in spring, as the common primrose, the oxlip, and cowslip; and several Japanese and other varieties are cultivated in gardens as ornamental plants. The varieties of the common primrose which have arisen from cultivation are very numerous.

Primrose League, THE, a political society of English women founded for the furtherance of conservative opinions in England, and named after the favorite flower of Earl Beaconsfield, one year after his death, April 19, 1881. This anniversary is observed by the wearing of the primrose and the annual meetings in each great center of population.

Primulaceæ (prim-u-lā'se-ē), the primrose order of plants, a nat. order of monopetalous exogens, distinguished by the stamens being opposite to the lobes of the corolla, and having a superior capsule with a free central placenta. It consists of herbaceous plants, natives of temperate and cold regions. Many have flowers of much beauty, and some are very fragrant. See *Primrose.*

Prince (prins; Latin, *princeps*), literally one who holds the first place. In modern times the title of prince (or princess) is given to all sovereigns generally.

Prince Albert, a town of Saskatchewan, Canada, on Saskatchewan River. It has lumber, grain and cattle interests. Pop. 13,450.

Prince Edward Island, an island forming a province of the Dominion of Canada, in the Gulf of St. Lawrence, and separated by Northumberland Strait from New Brunswick on the east and Nova Scotia on the south; greatest length, from east to west, about 130 miles; breadth, varying from 4 to 34 miles; area, about 2184 square miles. The coast line presents a

remarkable succession of large bays and projecting headlands. The surface undulates gently, nowhere rising so high as to become mountainous or sinking so low as to form a monotonous flat. The island is naturally divided into three peninsulas, and the whole is eminently agricultural and pastoral, the forests now being of comparatively limited extent. Wheat, oats, barley, potatoes and hay are the principal crops. Silver fox ranching has become an important industry. The fisheries also are important. There are two colleges, Prince of Wales College, head of the provincial school system; and St. Dunstan's (R. C.), both at Charlottetown (the capital). The island was first colonized by France, captured by Britain in 1745, restored and recaptured, and in 1873 was taken into the Confederation. The government is administered by a lieutenant-governor and a legislative assembly of 30 members, who are elected for four years. Pop. (1911) 93,728.

Prince of Wales, the title of the heir-apparent of the British throne, first conferred by Edward I on his son.

Prince's Metal, or PRINCE RUPERT'S METAL, a mixture of copper and zinc.

Princeton, (prins'ton), a city, county seat of Gibson Co., Indiana, 27 miles N. of Evansville, in an oil, coal and gas region. It has railroad shops, flour mills, coal-mining and other interests. Pop. (1920) 7132.

Princeton, a town of Mercer county, New Jersey 40 miles N. E. of Philadelphia and 10 miles N. E. of Trenton. It has gained distinction as the seat of Princeton University and Princeton Theological Seminary (*q. v.*). The town was first settled in 1696 and received its present name in 1724. It was here that the first State Legislature of New Jersey assembled. The Battle of Princeton was fought near the present site of the Graduate School, January 3, 1777, when an American force under General Washington defeated the British and forced Cornwallis to fall back to New York, leaving New Jersey in the hands of the Americans. Pop. (1920) 5917.

Princeton, a city, county seat of Mercer Co., West Virginia, 72 miles S. E. of Charleston. It was the scene of a Confederate victory over the Union forces in 1862. Pop. (1920) 6224.

Princeton Theological Seminary, an institution for the training of ministers for the Presbyterian Church, the oldest school of its kind in the United States. The seminary was established at Princeton, New Jersey, in 1812, with the Rev. Archibald Alexander as its first professor. The teaching force consists of a president and eleven professors, with several additional instructors. All professors are required to subscribe to the Westminster Confession of Faith. The teaching is along strictly orthodox lines, as distinguished from Union Theological Seminary (*q. v.*), New York, where more freedom of thought is permitted teachers and students. The library contains over 100,000 volumes.

Princeton University, a leading institution for the higher education of men at Princeton, N. J., established in 1746. It was called originally the College of New Jersey, and was located at Elizabethtown, N. J. The first president was Rev. Jonathan Dickinson. In 1748 the college was removed to Newark, and in 1752 land was purchased at Princeton, and the corner stone of the first building—the famous Nassau Hall—was laid in 1754. Instruction was first given in Nassau Hall in 1756. During the revolutionary war the college suffered heavily, but although the forces of England and the colonists surged across Princeton, the work of the institution went on, only one commencement, that of 1777, being omitted. From time to time many handsome buildings have been added. Among these may be mentioned West College, Reunion Hall, Witherspoon, Edwards, Dod, Brown, Blair and Stafford Little Halls, Upper and Lower Pyne Buildings, Seventy-nine Hall, Patton, Cuyler, Campbell, Holder and Hamilton Halls. Other beautiful buildings on the campus are the Isabella McCosh Infirmary, Dickinson Hall, Marquand Chapel, Alexander Hall, McCosh Recitation Hall, the University Library and Gymnasium, Graduate College, the Cleveland Memorial Tower (completed in 1912), the Palmer Memorial Stadium, and the University Dining Halls. An artificial lake, formed by flooding the lowlands near the university, was presented by Andrew Carnegie.

Instruction is given in philosophy, art and archeology, language and literature, mathematics and science. The Princeton Theological Seminary (*q. v.*) is a separate and distinct institution, though closely affiliated. The presidents of Princeton University have all been clergymen with the exception of Woodrow Wilson, who was head of the university from 1902 to 1910. He was succeeded by John Grier Hibben. In 1917 there were 972 students enrolled, a considerable falling off, owing to the war, a great number of

Princeton men volunteering for service. In 1921 there were 1967 students, including 149 in the Graduate School. Faculty and instructors, 198.

Principal (prin'si-pal), the term used in the United States to designate the proprietor, chief, or head of an academy or seminary of learning.

Principal and Agent, a designation in law, applied to that branch of questions which relate to the acting of one person for another in any commercial transaction. See *Agent, Broker, Factor.*

Printing (print'ing), in a general sense, is the art of stamping impressions of figures, letters, or signs, with ink, upon paper, vellum, cloth, or any similar substance; but the term is also applied to the production of photographs from negatives, where neither ink nor pressure is used. Printing may be done (1) from engraved metal plates, in which the ink is stored for transference in the sunk or incised lines of the pattern (see *Engraving*); (2) from a level surface, as polished stone, where the ink is confined to the lines by a repellent medium (see *Lithography*); or (3) from surfaces in relief, where the ink is transferred from the raised characters, which may be either on one block or on separate or movable types. The latter method is so much the more important that it gives its restricted meaning to the term *printing*, unless where otherwise qualified.

History.—The rudiments of the art of *typography* or *letterpress-printing* were undoubtedly known to the ancients so far as the taking of impressions from blocks is concerned, and this method is still practiced in China. The ancient Romans made use of metal stamps, with characters engraved in relief, to mark their articles of trade and commerce; and Cicero, in his work *De Natura Deorum*, has a passage from which Toland imagines the moderns have taken the hint of printing. Cicero orders the types to be made of metal, and calls them *formæ literarum*, the very words used by the first printers. In Virgil's time, too, brands with letters were used for marking cattle, etc., with the owner's name.

Block-printing in Europe, from single pieces of wood, can be traced back as far as the thirteenth century. In these blocks the lines to be printed were in relief as in modern wood-engraving, and each leaf of the book was printed from a single block. The leaves were usually printed only on one side of the paper, the blank sides being afterwards pasted together so as to give the volume the ordinary book appearance. By the middle of the fifteenth century block-book making was a distinct craft in Germany and the Netherlands. Among the earliest species of German origin is an *Apocalypsis*, containing forty-eight illustrations on as many leaves; and among those of Netherlandish origin, the *Biblia Pauperum* of forty leaves, both works of the early fifteenth century.

It is a matter of much dispute to whom is due the merit of adopting movable types. The invention has long been popularly credited to Johan Gutenberg, but critical examination of early Dutch and German specimens and historical evidence would seem to point to Laurens Janszoon Coster, of Haarlem, as the first inventor. (See *Coster, Gutenberg.*) The date of the Haarlem invention is variously placed between 1420 and 1430. Coster's types were first of wood, then of lead, and lastly of tin; the first book printed from movable types being probably one entitled *Speculum Nostræ Salutis.* Gutenberg in 1449 connected himself with a rich citizen in Mainz, named Johann Fust or Faust, who advanced the capital necessary to prosecute the business of printing. Soon after (probably in 1453) Peter Schöffer, who afterwards became Fust's son-in-law, was taken into copartnership, and to him belongs the merit of inventing matrices for casting types, each individual type having hitherto been cut in wood or metal. The oldest work of any considerable size printed in Mainz with cast letters, by Gutenberg, Fust, and Schöffer, finished about 1455, is the *Latin Bible*, which is called the *Forty-two-linea Bible*, because in every full column it has forty-two lines; or the *Mazarin Bible*, from a copy having been discovered in the library of Cardinal Mazarin in Paris. Fust having separated from Gutenberg in 1456, and obtained the printing-press for his own use, undertook, in connection with Peter Schöffer, greater typographical works, in which the art was carried to higher perfection. Fust was particularly engaged in the printing of the *Latin and German Bible*, the first copies of which, bearing date, were printed in 1462. Fust is said to have died of the plague in 1466 at Paris, upon which Peter Schöffer continued the printing business alone at Mainz. After the separation of Gutenberg and Fust the former had found means to procure a new printing-press, and had printed many works, of which the most remarkable is the *Astrological and Medical Calendar* (in folio, 1457). In 1462 the city of Mainz was taken and sacked by Adolphus, count of Nassau, and this circumstance is said to have so deranged the establishment of Fust and

Schöffer that many of their workmen were obliged to seek employment elsewhere. The truth seems to be that the inventor of the new art was Coster; that Gutenberg and Schöffer made important improvements on it, and aided by Fust widely spread the results of the new art. From this period printing made rapid progress throughout Europe. In 1465 we find works printed at Naples; and in 1467 Sweynheim and Pannartz, two of the most celebrated and extensive old printers, established themselves at Rome. In 1469 we find printing at Venice and Milan; in 1470 at Paris, Nuremberg, and Verona; and by 1472 the art had become known in all the important cities of the continent. In 1490 it had reached Constantinople, and by the middle of the next century had extended to Russia and America.

At the invention of printing the character of type employed was the old Gothic or German. The *Roman* type was first introduced by Sweynheim and Pannartz at Rome in 1467, and the *Italic* by Aldus Manutius about 1500. Schöffer, in his edition of Cicero's *De Officiis*, produces for the first time some Greek characters, rudely executed; but the earliest complete Greek work was a grammar of that language printed at Milan in 1476. The *Pentateuch*, which appeared in 1482, was the first work printed in the Hebrew character, and the earliest known *Polyglot Bible* — Hebrew, Arabic, Chaldaic, Greek, Latin — issued from the press of Genoa in 1516. Several printers' names have become famous not only for the beauty of their types, but also for the general excellence of their productions. Among these may be noted: The Aldi of Venice (1490-1597), Baden of Paris (1495-1535), Estiennes or Stephens of Paris (1502-98), Plantin of Antwerp (1514-89), Wechel of Paris and Frankfort (1530-72), Elzevir of Leyden and Amsterdam (1580-1680), and Bodoni of Parma (1768-1813).

The art of printing was first introduced into England by William Caxton, who established a press in Westminster Abbey in 1476. (See *Caxton.*) In the midst of a busy mercantile life, while resident in the Netherlands, he began about 1468 to translate *Le Recueil des Histoircs de Troye* of Raoulle le Fevre. This work was finished in 1471, and Caxton set about learning the new art of printing, with the view of publishing his book. The *Recueil*, the first English printed book, appeared in 1474, printed either at Bruges or Cologne. In 1475 *The Game and Playe of the Chesse*, the second English book printed, appeared at Bruges, and in 1476 he began to practice the new art at Westminster. The first book printed in England, the *Dictes and Sayings of the Philosophers*, was printed in November, 1477. Between that date and 1491 Caxton printed upwards of seventy volumes, including the works of Lydgate, Gower, Chaucer, Malory, etc. Upwards of twenty-two of these were translated by himself from French, Dutch, or Latin originals. The whole amounted to more than 18,000 pages, nearly all of folio size, some of the books having passed through two editions, and a few through three. Caxton distinguished the books of his printing by a particular device, consisting of the initial letters of his name, with a cipher between. His first performances were very rude, the characters resembling those of English manuscripts before the Conquest. Most of his letters were joined together; the leaves were rarely numbered, the pages never. At the beginning of the chapters he only printed, as the custom then was, a small letter, to intimate what the initial or capital letter should be, leaving that to be made by the illuminator, who wrote it with a pen, with red, blue, or green ink.

Caxton's two most distinguished successors were Wynkin de Worde and Richard Pynson. The former, a native of the Dukedom of Lorraine, served under Caxton, and after the death of his master successfully practiced the art of printing on his own account. The books which he printed are very numerous, and display a rapid improvement in the typographical art. He died in 1534. Pynson was a native of Normandy, and it is supposed that he also served under Caxton. The works which he printed are neither so numerous nor so beautiful as those of Wynkin de Worde. He was the first printer, however, who introduced the Roman letter into England. To Wynkin de Worde and Pynson succeed a long list of ancient typographers, into which we cannot enter here.

The first Scottish printers of whom we have any authentic account were Walter Chapman, a merchant in Edinburgh, and Andrew Millar, who, in consequence of a patent from James IV, established a press at Edinburgh in 1507. In 1536 Thomas Davidson printed, 'in the Fryere's Winde,' Edinburgh, the *Chronicles of Scotland*, by Boethius, and in 1540 the works of Sir David Lindsay. Robert Leprevik printed extensively both at Edinburgh and St. Andrews. Thomas Vautrollier was another old Scottish printer, who brought out, in 1585, Calvin's *Institutes;* in 1589 Tusser's *Points of Good Husbandry;* and in 1597 the *De-*

monologie of King James VI. Edward Raban, a native of Gloucestershire or Worcestershire, introduced the art into Aberdeen about 1620-22, and continued printing there till 1649. In 1638 George Anderson, by special invitation of the magistrates, set up the first printing-press in Glasgow. In later days Scotland highly distinguished itself by the extent and beauty of its typographical productions. Ruddiman, who flourished at Edinburgh during the first half of the eighteenth century, was one of the most learned printers which any country has produced. Printing was introduced in the New England States of America in 1639, the first known print being the *Freeman's Oath;* in 1640 what is known as the *Bay Psalm-book* was printed in Cambridge, Massachusetts. Benjamin Franklin was one of the first to study and practice the art of printing at Boston, and afterwards practiced it for a long time in Philadelphia.

Processes.— The various letters and marks used in printing are cast on types or rectangular pieces of metal, having the sign in relief on the upper end. These types, with the low pieces required to fill up spaces, are placed in cells or boxes in a shallow tray or case in such way that any letter can be readily found. The cases are mounted on a stand or frame, so that they may lie before the person who is to select and arrange the types, technically styled a *compositor.* The Roman types used are of three kinds: an alphabet of large capitals (A B C, etc.), one of small capitals (A B C, etc.), and one of small letters (a b c, etc.), called *lower-case* by the compositor. Of italic characters only large capitals and lower-case are used. Besides these there are many varieties of letter, such as Old English, and imitations of manuscript letters, the mention of which could only be serviceable to the practical printer. Types are of various sizes, the following being those in use among British printers for book work: — English, Pica, Small Pica, Long Primer, Bourgeois, Brevier, Minion, Nonpareil, Pearl, Diamond. English has $5\frac{1}{3}$ lines and Diamond 17 lines in an inch. Type is now cast on the standard point system, pica, or 12 point, being the standard. Six pica ems measure 1 inch. Brevier type is equal to 8 point, nonpareil 6 point. The other types named above are irregular sizes as measured by the point system. All sizes from $5\frac{1}{2}$ to 12 point are made. Large, display type fonts are multiples of 6 point. (This Encyclopædia is set in Minion, or 7 point.)

Composing.— The main part of the work of a compositor consists in picking up types from their respective boxes, as required to reproduce the words in the author's manuscript that has been supplied to him. The types are lifted by the right hand and placed in a composing stick held in the left. The composing stick is a sort of box wanting one side, and having one end movable to enable it to be adjusted to any required length of line. When the words in the stick have increased till they nearly fill the space between the ends they are 'spaced out,' that is, the blanks between the words are so increased or diminished as to make them exactly do so. Line is in this way added to line till the stick is full, when it is emptied on to a flat board with edges, called a *galley.* Subsequently the column of types so produced is divided into portions of definite length, these are furnished with headlines and folios, and become pages.

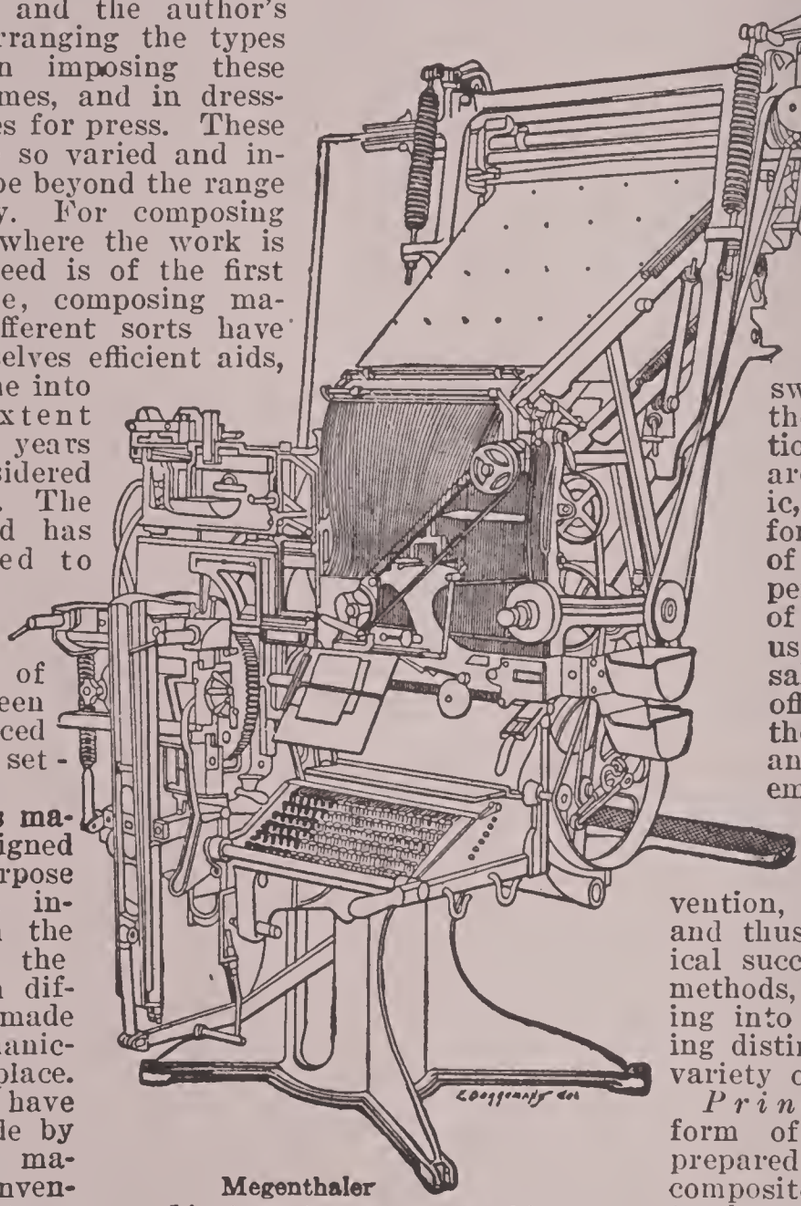
The matter so set up is now proofed; that is, an impression is printed from it, and this goes into the hands of the printer's reader. The reader compares the proof with the author's manuscript, marks all deviations, and corrects the compositor's errors. When these have been put right a fresh proof is taken and is sent to the author for his inspection. When the pages of a book are finally passed by the author as correct, they may be arranged either for casting (done by stereotype or by electrotype process) or for going to press to be printed from. If the former, they are fixed, probably singly, in a rectangular frame of iron, or *chase,* as it is called, by means of wedges, and sent to the foundry. If the latter, so many of them as are required to cover one side of the sheet of paper to be printed on are fixed in a correspondingly larger frame and sent to the printing press or machine. The pages thus arranged and fixed in the chase is called a *forme.* They are placed in such order that when the impression is taken off, and the sheet folded, the pages will follow each other in proper order.

When there are more sheets than one in a work it is advisable to have these readily distinguishable from each other. To secure this, letters (called *signatures*) are placed at the bottom of the first page of each sheet, A for the first sheet, B for the second, C for the third, and so on through the alphabet. Thus, by merely looking at the signature the binder of the book can be sure that the sheets follow in proper sequence.

When the required number of copies have been printed from a forme of movable type, or when casts have been taken from a page, the chase is carried back

to the composing room, and the compositor undoes the work that was formerly done, by *distributing* all the types, that is, putting them back into their respective cells in the case. They are then ready for further combinations as required.

Composing Machines.— Several attempts have been made to expedite the work of the compositor by calling in the aid of machinery. A large portion of the compositor's work consists in correcting the reader's and the author's proofs, in arranging the types in pages, in imposing these pages in formes, and in dressing the formes for press. These processes are so varied and intricate as to be beyond the range of machinery. For composing newspapers, where the work is plain and speed is of the first consequence, composing machines of different sorts have proved themselves efficient aids, and have come into use to an extent that a few years ago was considered very unlikely. The same method has been applied to bookmaking and the old system of hand-setting of types has been largely replaced by machine-setting.

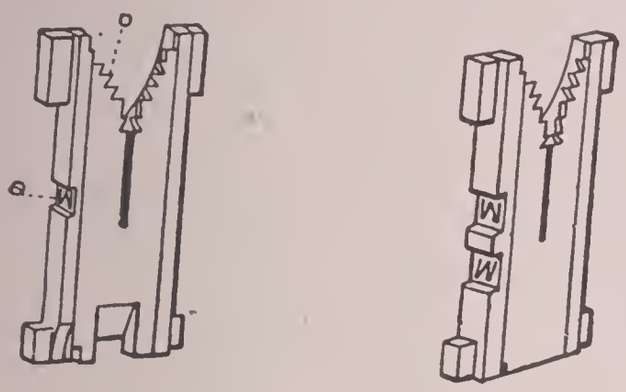


Megenthaler
Linotype Typesetting Machine.

Various machines designed for this purpose have been invented, in the earlier ones the types being in different ways made to fall mechanically into place. But all these have been set aside by the linotype machine, the invention of Ottmar Mergenthaler, this being not only a composing but a type-casting machine. In its main features the linotype is wholly unlike any previous machine. No types are used; metal matrices similar to those employed by typefounders take their place. The few of these matrices used are stored in vertical channels as types are in other machines, and they are similarly brought together into words and lines on the manipulation of keys on a keyboard somewhat like a typewriter's by the compositor. When a line of matrices is composed it is removed to another part of the machine, where it is automatically spaced out, then molten metal is injected into it, a 'line-o'-type' cast in one piece is produced; this line, dressed by cutters to correct thickness and height, takes its place in a column, while the matrices themselves go back along rails, and drop off into their respective channels as they are reached. When it is remembered that after the compositor has set up the line of matrices, checked it as correct, and turned a switch, the whole of the subsequent operations indicated above are purely automatic, some idea may be formed of the amount of ingenuity expended on this piece of mechanism. It is used almost universally in newspaper offices throughout the entire world, and is very largely employed in bookmaking. Another machine, the Monotype, of later invention, casts single types, and thus forms a mechanical successor to the older methods, and is now coming into extensive use, being distinguished by a rich variety of type faces.

Printing.—When the form of types has been prepared for press by the compositor it is passed over to the pressmen, who form a distinct craft. The act of printing has two operations. First there is the application of ink to the face of the type, and then the pressing of a sheet of paper on the types with such weight as to cause the ink to adhere to it. The ink used is a thick, viscid fluid made of boiled linseed-oil and lampblack. It is applied to the type by means of a roller covered with an elastic compound of melted glue and treacle. When the

printing is being done on hand-press the roller is carried on a light frame having handles, by which it is gripped by the hands of the pressman or printer, who in working passes the roller several times over an inked table, and then backwards and forwards over the forme. When the printing is done on machine, two or more rollers are placed in suitable bearings, and generally the forme is made to travel



Linotype Matrices.

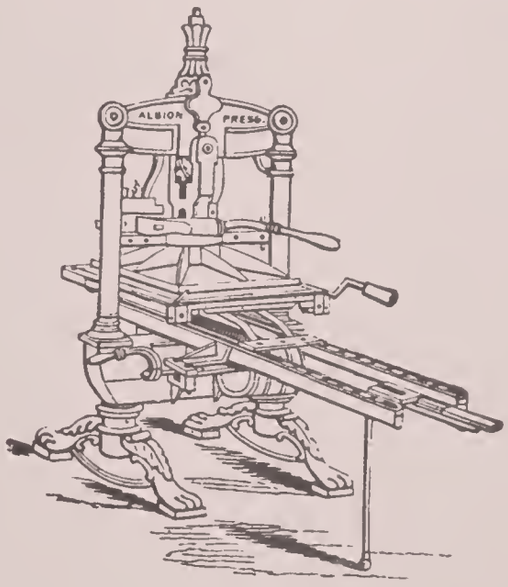
Single matrix. Double matrix.
a, letter mold. *o*, distribution teeth.

under them and receive ink in passing. In hand-printing the paper is placed and the pressure given by a second workman. In machine-work the sheet may be placed by an assistant, or taken in by the machine itself, or otherwise supplied by a continuous web from a reel.

These operations, purely mechanical, have, however, to be preceded by a stage of preparation called *making ready*, which calls for more or less skill and taste from the workman. His craft in plain work is to produce printed sheets the letters or reading on which shall be sharp yet solid, with the color or depth of black uniform all over the sheet, and each sheet uniform with the others which are to form the book. This is attained partly by properly regulating the supply of ink, but mainly by getting uniformity of pressure, as any portion of a sheet more firmly impressed than another will bring off more color. When there are illustrations in the forme the printer's craft is the reverse of this, for he seeks to give artistic effect to the pictures by all shades of color, from deep black in the shadows to the lightest tints in the skies. These effects are got entirely by variations in pressure, the dark parts being heavily pressed, while the paper barely touches the inked surface in the light tints.

Mechanism of Printing.— The mechanism of printing, at first of a very simple kind, has latterly attained to great perfection and efficiency. Three methods are followed for obtaining the impression which produces the printed sheet. The first and simplest is by the advance toward each other of two flat surfaces, one (the bed) carrying the type-forme, the other (the platen) carrying the blank sheet to be printed. The second is by the rotation of a cylinder above a type-table traveling backwards and forwards, the table being in contact with the cylinder in advancing and free in returning. The third and most recently adopted method is the contact of two cylinders revolving continuously in the same direction, one carrying the type-surface and the other bringing against it a continuous web of paper, which it afterwards cuts into sheets. Presses or machines of the first class are called *platen*, the second *cylinder*, and the third *rotary*.

The press used by Gutenberg was of a very rude description, the ink being applied by means of leather-covered balls stuffed with soft material, and having suitable handles, and the pressure being obtained by a screw which brought down a flat block or platen. The first improvement on this device seems to have been the construction of guides, enabling the type-forme to be run under the impressing surface and withdrawn with facility. Other necessities soon after arose, chiefly that of obtaining a rapid return of the platen from the position



Albion Press.

at which it gave the pressure without the screw requiring to be turned back: but it was not till the year 1620 that this was met by the invention of Willem Janszoon Blaeu, a native of Amsterdam. Charles Mahon, the third earl of Stanhope, was the author of the next great improvement in printing-presses, about

1800. He devised a combination of levers, which he applied to the old screw-press. These levers brought down the platen with greatly increased rapidity, and what was of still greater importance, converted at the proper moment that motion into direct pressure. The pressure was under control and capable of easy adjustment. The press was of iron, not of wood as was the case with all previously constructed presses, and it exhibited a number of contrivances of the most ingenious character for facilitating the work of the pressman. In 1813 John Ruthven, a printer of Edinburgh, patented a press on the lever principle, with several decided improvements. The Columbian Press, invented in 1814 by G. Clymer, of Philadelphia, and the Albion Press, were the latest contrivances. Even in its best form the hand-press is laborious to work and slow in operation, two workmen not being able to throw off more than 250 impressions in an hour. It therefore became imperative, especially for newspapers, to devise a more expeditious and at the same time a more easy method of taking impressions from types.

So early as the year 1790 Mr. Nicholson took out letters-patent for printing by machinery. His printing-machine never became available in practice, yet he deserves the credit of being the first who suggested the application of cylinders and inking-rollers. About ten years later König, a printer in Saxony, turned his attention to the improvement of the printing-press, with a view chiefly to accelerate its operation. Being unsuccessful in gaining assistance in his native country to bring his scheme into operation, he came to London in 1806. There he was received with equal coldness, but ultimately, with the assistance of Mr. Bensley, he constructed a machine on the platen or hand-press principle. Afterwards he adopted Nicholson's cylinder principle, and succeeded in producing a machine which so satisfied Mr. Walter, proprietor of the *Times* newspaper, that an agreement was entered into to erect two to print that journal. On the 28th of November, 1814, the reader of the *Times* was informed that he held in his hand a paper printed by machinery moved by the power of steam, and which had been produced at the rate of 1800 impressions per hour. This is commonly supposed to be the first specimen of printing executed by steam machinery; but König's platen machine was set to work in April, 1811, and 3000 sheets of signature H of the *Annual Register* for 1810 were printed by it. That was undoubtedly the first work printed by machinery.

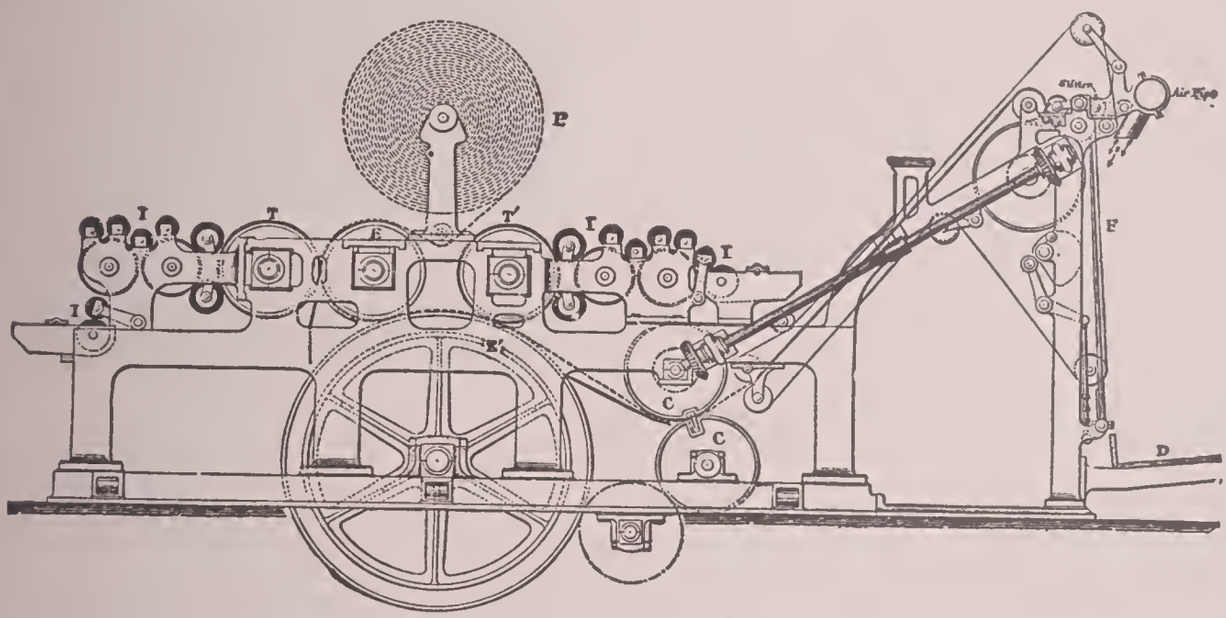
A further improvement was made in May, 1848, by Applegarth. His machine, which printed 10,000 impressions per hour, had a vertical cylinder 65 inches broad, on which the type was fixed, surrounded by eight other vertical cylinders, each about 13 inches diameter and covered with cloth, round which the paper was led by tapes, each paper or impression cylinder having a feeding apparatus and two boys tending. The type used was the ordinary kind, and the form was placed on a portion of the large cylinder. The surface of the type formed a portion of a polygon, and the regularity of the impression was obtained by pasting slips of paper on the impression cylinders.

Few machines, however, of this construction were made, a formidable rival having appeared, devised by Messrs. Hoe & Co., of New York. It was constructed with from two to ten impression cylinders, each of them printing from a set of types placed on a horizontal central cylinder of about 6½ feet in diameter, a portion of which was also used as a cylindrical ink-table, each of the encircling cylinders having its own inking rollers and separate feeder. A machine of this construction, having ten impression cylinders, threw off at the rate of 18,000 impressions an hour.

Repeated attempts were made by inventors to construct a machine which would print from the continuous roll or web in which paper is supplied by the paper-making machine. Experiments were conducted successfully by Nicholson, Stanhope, Sir Rowland Hill, Applegarth, and others, but the difficulties for the time proved insurmountable. These, however, were at length overcome, and the result is the construction of a class of machines which possess the merit of being at once simpler, more expeditious, and more economical in requiring less attendance than any previous contrivance.

The first machine on the web principle that established itself in the printing-office was the 'Bullock,' an American contrivance. It was, however, speedily eclipsed by the 'Walter Press,' invented and constructed on the premises of the *London Times*. Since then several other rotary machines have been invented and brought into extensive use. The 'open-delivery' machine (that is, unprovided with an apparatus for folding the papers) of the latter firm may be taken as a type of rotary machines, and is shown in the figure. The roll of paper P is placed im-

mediately above the type cylinders, which are fitted to a horizontal frame. The web is printed on one side by the forme on the cylinder T, then on the other on cylinder T′, and thence passes between two cutting cylinders C C which are of the same diameter as the printing cylinders. The sheets thus severed then travel upward over a drum, and when any desired number of sheets are gathered they are directed by a switch down the flyers F and deposited on the taking-off board D. E is the impression cylinder for the printing cylinder T, and E′ for T′. The cylinder E′ is made of large diameter in order that the blanket with which it is covered may absorb the surplus ink of the first-printed side of the web. The inking apparatus consists of two drums parallel to each other, each provided with the necessary inking-rollers I I. The producing



Open-delivery Web Machine of Hoe & Co.

power of this machine is from 12,000 to 15,000 perfect eight-page papers per hour. Machines of later origin very greatly surpass this in productive capacity, papers of 8 to 12 pages being printed at a speed of 24,000 per hour, and 4 to 6 page papers at 48,000 per hour.

The machines hitherto described have been of the cylinder class and of the outcome of that class — the rotary. The *platen* or flat-surface printing-machine was contrived soon after the introduction of the cylinder, and had for its aim the production of work equal in quality to that produced by the hand-press, and at a greater speed. It is constructed upon the same principle as the hand-press so far as the mode of taking the impression is concerned, but is distinguished from that press in that it automatically inks the forme, runs in the carriage, brings down the platen and returns it, then runs out the carriage, the tympan being lifted by attendants, who remove the printed sheet, replace it with another, turn down the tympan, and leave the machine to go through its motions over again. The great improvements recently made on cylinder machines, especially of the 'French' class, having made them capable of producing book work of the finest quality, the use of the platen is now confined to special sorts of work.

Up to 1840 there was no press strong enough to print properly a wood cut of 48 square inches in size; now cuts of 2000 square inches, or 50 by 40 inches, are printed in the most perfect manner. The colored supplements of the pictorial journals are often admirable reproductions of works of high art.

Prior (prī'er), a title somewhat less dignified than that of abbot, formerly given to the head of a small monastery, designated a *priory*. Similarly the term *prioress* was applied to the head of a convent of females. See *Abbey*.

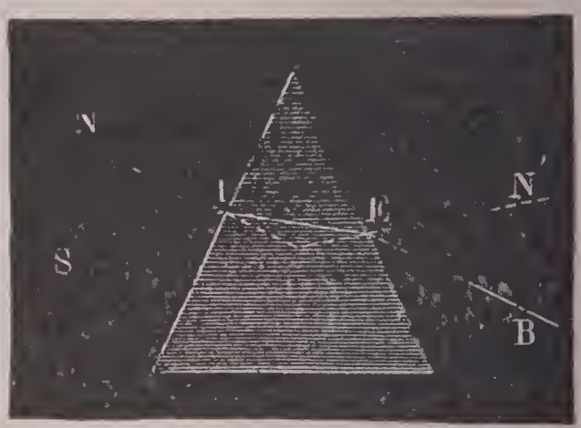
Prior, Matthew, an English poet, the son of a joiner, born in 1644, and educated at Westminster School. He early found a patron in the Earl of Dorset, through whose good offices he was enabled to enter, in 1682, St. John's College, Cambridge, where he was graduated as B.A. in 1686, and was shortly after chosen fellow. At college he contracted an intimacy with Charles Montagu, afterwards Earl of Halifax, in concert with whom, in 1687, he composed the *Country Mouse and City Mouse* — a parody on Dryden's *Hind and Panther* This work

brought him into fame, and in 1690 he was appointed secretary to the English embassy at The Hague. In 1697 he was nominated secretary to the plenipotentiaries who concluded the Peace of Ryswick, and on his return was made secretary to the lord-lieutenant of Ireland. In 1701 he entered Parliament as a Whig, but soon after changed his politics and joined the Tory party. He was in consequence excluded from office during the régime of Marlborough and Godolphin, and he employed himself in writing and publishing another volume of poems. In 1711, when the Tories again obtained the ascendency, he was employed in secretly negotiating at Paris the terms of the Treaty of Utrecht, and he remained in France until 1714, at first as a secret agent, afterwards as ambassador. On the accession of George I, when the Whigs were once more in power, Prior was recalled and examined before the privy-council in respect to his share in negotiating the Treaty of Utrecht, and was kept in custody on a charge of high treason for two years, although ultimately discharged without trial. During his imprisonment he wrote *Alma, or the Progress of the Mind*, which, together with his most ambitious work, *Solomon*, was published in 1718. He died in 1721 and was buried in Westminster Abbey. Prior was endowed with much wit and power of satire; and many of his lighter pieces are charming, but his serious performances fail in moving either the feelings or the fancy.

Priscianus (prish'i-an-us), usually known as PRISCIAN, a celebrated Roman grammarian, who lived in the latter half of the fifth century of our era, and of whom little more is known than that he was born at Cæsarea, taught grammar at Constantinople in the time of Justinian, and wrote the *Institutiones Grammaticæ*, an exposition of Latin grammar. His work, successively abridged by several writers, formed the basis of instruction in Latin up to the fifteenth century, and there exist at present about one thousand MSS. of it, none dating before the ninth century. It contains numerous quotations from Latin authors now lost.

Priscillian (pris-il'i-an), the founder of a sect in Spain, known as Priscillianists, in the middle of the fourth century, their doctrines being a mixture of Gnosticism and Manichæism. Priscillian was himself a wealthy and accomplished man, of very temperate and strenuous habits. His followers did not leave the Catholic Church, and he was actually at one time made a bishop himself. He was ultimately executed at Treves in 385, after a prolonged struggle with the orthodox clergy. The most distinctive part of his creed was the belief in an evil spirit as the supreme power. His sect lasted until about 600 A.D.

Prism (prizm), in geometry, a solid figure which might be generated by the motion of a line kept parallel to itself, one extremity of it being carried round a rectilinear figure. A 'right prism' is one in which the faces are at right angles to the ends. In optics a prism is a transparent body having two plane faces not parallel to one another, and most commonly it is made of glass, and triangular in section, the section forming either a right-angled, equilateral, or isosceles triangle. The two latter



Light passing through Prism.

varieties are most familiar. If a ray of light, SI, enter such a prism by one of the two principal faces, it is bent in passing through so as to take the direction by SIEB. The angle which the ray in the prism makes with the normal, NI, is always smaller than the angle of incidence, NIS, and the angle which it makes with the normal, EN', is smaller than the angle of emergence, N'EB, the ray being always bent towards the base of the prism. Not only is the ray thus bent, but it is also decomposed, and by suitable arrangements could be exhibited as made up of what are usually known as the seven primary colors: violet, indigo, blue, green, yellow, orange, and red. See *Color*, *Light*, *Optics*, *Spectrum*.

Prison (priz'n), a house in which a person is confined and thereby deprived of his personal liberty; especially a building for the confinement or safe custody of criminals, debtors, or others. Imprisonment is now one of the recognized methods of judicially punishing certain crimes; but formerly it was employed in nearly every coun

try in Europe for purposes of injustice and oppression. Men were hidden in dark dungeons, where in a short time they perished, through the inefficiency of the law to protect those who were offensive to the powerful; and even in Great Britain, where the laws have always condemned the incarceration of the innocent, the prison was, by the connivance of the authorities, made subservient to gross injustice and cruelty. To the eighteenth century belongs the honor of initiating the proper regulation of imprisonment. In Britain parliamentary inquiries brought out strange revelations as to the horrors of the debtors' prisons; but public interest in the subject was only effectually aroused by the extraordinary exertions of the celebrated John Howard, who in 1773 began, without any official standing, to make inspections of the chief English prisons. He found these places not only insanitary and ill ventilated, but filthy, poisonous, and in nearly every case overcrowded. Disease was rampant, and no measures were taken to prevent its spread; many of the prisons were utterly unfit for human creatures to live in; and, to crown all, such intercourse was allowed between the prisoners as ensured the reduction of all to the level of the most corrupt and criminal. Howard's revelations caused such a feeling throughout the country that prison reformation could no longer be delayed. The result was that parliament entrusted a committee of three (of whom Howard was one) with the duty of framing a suitable scheme for the future management of the prisons. Their recommendations were embodied in the Act 19, Geo. III c. 74 (1779), which sets forth distinctly the principles that were to govern future prison discipline in Britain. The chief features emphasized are — solitary confinement, cleanliness, medical help, regular work, and the enforcement of order — the same principles, indeed, which are now adopted by every civilized state in the world. Up almost to this time many criminals had been sent as convicts to America; but this being no longer possible, the new scheme was intended to provide accommodation for such at home. Australia, however, now presented itself as a new field for transportation, and the legislature hailed with joy this new receptacle for criminals. The newborn zeal of the public died out with the absence of any need for change, and the whole scheme dropped for eleven years, to be revived again by the earnest enthusiasm of a single individual. In 1791 Bentham published a work, in which he constructed (on paper) a model prison, which he called the *Panopticon*. Next year he proposed himself to construct the building in reality. His ideal prison was not unlike Howard's; but Bentham trusted greatly to publicity and free communication between criminals and the public for the protection of the inmates from oppression. In 1794 the government adopted his scheme, but the construction of the prison was put off till 1810, when Sir Samuel Romilly moved Parliament to take up the matter once more. This time it was pushed to a successful issue; and in 1811 was erected the famous penitentiary of Millbank, virtually on Howard's plans, and destined to be the precursor of the modern prison. This was only the beginning of reform, and the credit of carrying it on is largely due to the Prison Discipline Society, and to Mr. Buxton and Mrs. Fry, its leading members. The latter began her work at Newgate in 1813, and found that prison in a state as bad as can be imagined. Among the prisoners themselves she effected a reformation, perhaps only temporary; but among the public her efforts inaugurated a desire for improvement which resulted in the abolition of all such scandals. In 1824 and 1825 the legislature passed important acts for the regulation of prisons, containing provisions for moral and sanitary care of prisoners, separation of the sexes, etc. The use of irons was partially forbidden, and separate cells for each prisoner recommended. These laws, though not carried out to the letter at first, were very helpful to future reformers. In 1831 a committee of the House of Commons reported in favor of separate cells in all cases, and this suggestion was adopted. The gradual work of modernizing prisons then went on until the cessation of transportation to New South Wales in 1840 and the general defects of this system rendered it necessary to look out for new ways of disposing of the criminal population. The chief features of the new scheme now brought into operation consisted of the following: (1) Separate confinement in a penitentiary for a short period; (2) hard prison labor in some public work; and (3) transportation with ticket-of-leave. For the first of these forms of punishment the existing prisons were used; for the second, which really came in place of the former system of wholesale transportation, public work was found at Portland, Dartmoor, and Portsmouth. The third was not successful. The colonies refused to receive the ticket-of-leave

men, and these had ultimately to be liberated at home. At present the system of imprisonment in Britain stands thus: When the convict is sentenced for a period of two years or less, the punishment is technically termed imprisonment. The criminal passes the time in a local prison, where he lives in solitary confinement and works at the tread-wheel for a month; if his conduct is good he receives marks which entitle him to improved conditions as the close of his term approaches. Penal servitude is the title applied to terms of imprisonment which exceed two years. It is passed in a convict prison, and is divided into three periods. The first lasts nine months, is one of solitary confinement, and during it the convict is set to work at some industry. The second period is also distinguished by cellular isolation, but the convict works along with others at one of the great convict prisons, such as Portland or Dartmoor. The final period is that of release on ticket-of-leave, during which the convict is obliged to report himself at intervals to the police.

In the United States prison horrors in the early days differed only from those of the mother country in the fact that prisons were rare. Connecticut for more than fifty years had an underground prison in an old mining pit. In Philadelphia all grades of criminals and both sexes were huddled together. In Boston debtors were confined with criminals in common night-rooms. Every village had its stocks, pillory, and whipping-post. Reform began in Philadelphia, where in 1776 was formed 'The Society for Alleviating the Miseries of Public Prisons.' The Boston 'Prison Discipline Society' of 1824, and the 'Prison Association of New York,' organized later, are still active. The 'National Prison Association of America' was formed in 1870, now one of the most efficient in the world. Prison reform congresses have been held in all large cities, where the humanitarian influences of state officials have been unified in one body. One of the misfortunes of the prison systems in many of the States is a disposition to regard convicts as slaves of the state, the profit of whose labor is so much clear gain to the state treasury. Competition with labor outside the prison walls being thus forced, troubles have ensued of great peril — as in Tennessee in 1890-93 among iron and coal miners, and in other Southern and Western States. In some of these States the convicts are made to perform outdoor labor and at times hired out to contractors by whom they are often treated very harshly and cruelly. The evils of this system have of late been made evident, and earnest efforts to reform or do away with the system are being made. See also *Punishment*.

Privateer, a vessel of war owned and equipped by private individuals to seize or plunder the ships of an enemy. Such a vessel must be licensed by government and under a letter of marque, otherwise she is a pirate. The letters of marque were first granted in England during the reign of Henry V, in view of the war with France; and they were issued to aggrieved subjects in order that they might compensate themselves for injury done by foreigners. In the sixteenth century it became common to grant commissions to privateers. England, Holland, and Spain, as the three principal naval powers, used this effective weapon freely; and France also sent out privateers in every war in which she was engaged. A neutral is not forbidden by the law of nations to accept a commission for privateering; but he may be, and generally is, by treaty. In 1818 Congress passed a law forbidding enlistments on foreign privateers. By the Declaration of Paris, 1856, the great powers of Europe mutually agreed to abandon the right to arm privateers in case of war; but several nations, chief of them being the United States and Spain, have not agreed to this, and it is doubtful whether it will be always strictly acted upon even by the parties to the declaration. The German volunteer fleet of 1870 can not be very clearly distinguished from a collection of privateers. The practice of privateering, while useful to maritime countries, and necessary at one period to England, is very harassing to trade, and gives endless opportunities for private plunder. It was probably in deprecation of irresponsible warfare of any kind that the powers agreed to abandon privateering in 1856. At the Hague Conference of 1907, the question of privateering was considered, and strict precautions taken against the revival of this practice in naval war, by insisting that when merchant vessels are converted into cruisers they shall be formally enrolled on the naval list and placed under the command of a commissioned naval officer, with a crew subject to naval discipline.

Privet (priv'et; *Ligustrum*), a genus of plants of the order Oleaceæ. The common privet (*L. vulgāre*) is a native of Europe, growing 8 or 10 feet high; the leaves are elliptico-lanceolate, entire, and smooth; the flowers slightly odorous, white at first, but soon chang-

ing to a reddish brown; and the berries dark purple, approaching black. This species is much used in English gardens for ornamental hedges. It is found in woods from Virginia to Mississippi, and is now widely used for hedges and other ornamental purposes in the United States. There are numerous other species.

Privilege (priv'i-lij; Latin, *privilegium*), a particular exemption from the general rules of law. This exemption may be either *real* or *personal:* real, when it attaches to any place; personal, when it attaches to persons, as ambassadors, members of Congress, clergymen, lawyers, and others. Real privilege is now of little importance; personal privilege, however, is guaranteed to many individuals. Suitors and counsels are exempt from arrest while in court; and Congressmen while in attendance in and going and returning from their respective Houses.

Privileged Communication.

See *Confidential Communication.*

Privy-chamber, GENTLEMEN OF THE, officers of the royal household of England, instituted by Henry VII. Their duties are to attend the sovereign; but their appointment is now merely a mark of honor, neither service nor salary being attached to their posts.

Privy-council, the council of state of the British sovereign, convened to concert matters for the public service, and for the honor and safety of the realm. The English privy-council may be said to have existed from times of great antiquity; but the *concilium ordinarium*, established by Edward I, was the parent of the modern institution. It consisted of the chief ministers, judges, and officers of state, and grew in power and influence rapidly, though repeatedly checked by jealous Parliaments. Since the time of the Long Parliament the power of the council has been much reduced, and the rise of the cabinet has effectually blotted out all the more important functions of the earlier body. The privy-council of Scotland was absorbed in that of England at the union; but Ireland has a special privy-council still. As it exists at present, the number of members of the privy-council is indefinite; they are nominated by the sovereign at pleasure, and no patent or grant is necessary, but they must be natural-born subjects. The list of privy-councilors (some 200 in number) now embraces, besides the members of the royal family and the members of the cabinet, the archbishops and the Bishop of London, the great officers of state, the lord-chancellor and chief judges, the speaker of the House of Commons, the commander-in-chief; and other persons who fill or have filled responsible offices under the crown, as well as some who may not have filled any important office. Officially at the head is the lord-president of the council, who is appointed by patent, and who manages the debates and reports results to the sovereign. A member of the privy-council has the title of 'right honorable.' It is only on very extraordinary occasions that all the members attend the council, and it is not now usual for any member to attend unless specially summoned. The attendance of at least six members is necessary to constitute a council. Privy-councilors are by their oath bound to advise the crown without partiality, affection, or dread; to keep its counsel secret, to avoid corruption, and to assist in the execution of what is resolved upon. While the political importance of the privy-council, once very great, has been extinguished by the growth of the system of party government, it still retains functions both administrative and judicial.

Orders in council are orders issued by the sovereign, by and with the advice of the privy-council, either by virtue of the royal prerogative, and independently of any act of Parliament, or by virtue of such act, authorizing the sovereign in council to modify or dispense with certain statutory provisions which it may be expedient in particular conjunctures to alter or suspend.

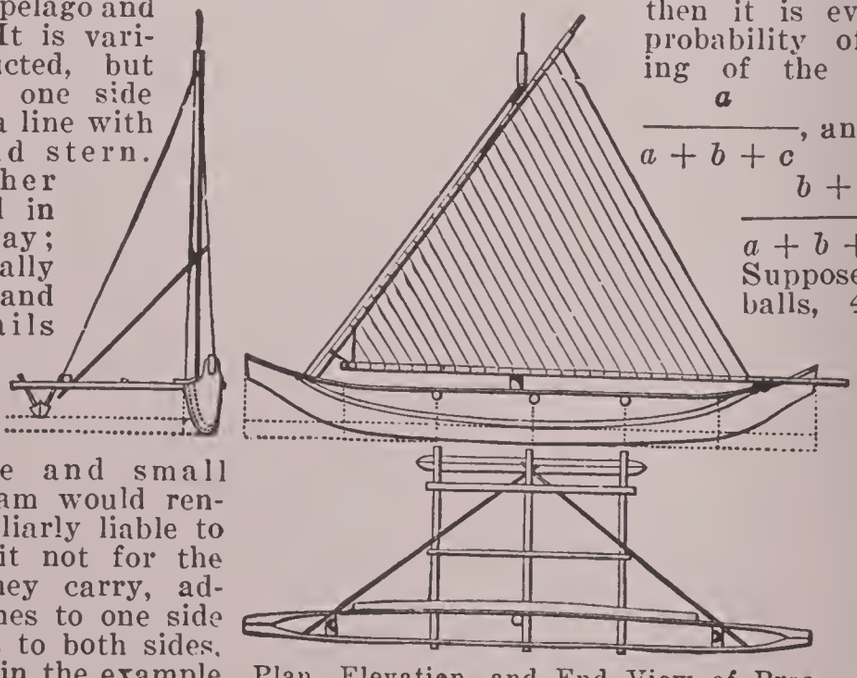
Privy-purse, KEEPER OF THE, an officer of the royal household of Great Britain, whose function it is to take charge of the payment of the private expenses and charities of the sovereign.

Privy-seal, a seal appended by the British sovereign to such grants or documents as are afterwards to pass the great seal. Since the time of Henry VIII the privy-seal has been the warrant of the legality of grants from the crown, and the authority for the lord-chancellor to affix the great seal; such grants are termed letters-patent. The officer who has the custody of the privy-seal is called lord privy-seal, and is the fifth great officer of state, having also generally a seat in the cabinet.

Prize (prīz), anything captured in virtue of the rights of war. Property captured on land is usually called *booty*, the term prize being more particularly used with reference to naval captures. The right of belligerents to

capture the property of their enemies on the sea is universally admitted, as well as the right to prevent violation of the law of nations by neutrals, so long as the independence of other nations is not interfered with. It is accordingly settled as a principle of the law of nations that every belligerent has a right to establish tribunals of prize, and to examine and decide upon all maritime captures; and likewise that the courts of prize of the captors have exclusive jurisdiction over all matters relating to captures made under the authority of their sovereign; excepting only in cases where the capture was made upon the territory of a neutral, or by vessels fitted out within a neutral's limits. These cases involve an invasion of the neutral's sovereignty, and must be adjudicated in his court. The decisions of the prize courts are final and conclusive upon the rights of property involved; and if their judgments work injustice to the subjects of other powers their claims must be adjusted between the sovereigns of their respective states. Prior to the entrance of the United States into the European war (1917), the American government protested against the British procedure of taking neutral vessels into port for examination, contending that the examination should be carried out on the high seas; Great Britain pleaded that because of Germany's unlawful employment of the submarine the prize rules must of necessity be altered. The decisions of national prize courts may properly be subjected to international review.

Proa (prō'a), a peculiar kind of sailing-boat used in the Malay or Eastern Archipelago and the Pacific. It is variously constructed, but regularly has one side quite flat, on a line with the stem and stern, while the other side is curved in the usual way; and being equally sharp at stem and stern, it sails equally well in either direction without turning. Their shape and small breadth of beam would render them peculiarly liable to overset were it not for the outrigger they carry, adjusted sometimes to one side and sometimes to both sides. The outrigger in the example here shown is a large structure supported by and formed of stout timbers. The outrigger may have weights placed on it and adjusted according to circumstances. Proas carry a lugsail generally of matting.



Plan, Elevation, and End View of Proa.

Probabilists (prob'a-bil-istz), a name applied to those philosophers who maintain that certainty is impossible, and that we must be satisfied with what is probable. This was the doctrine of the New Academy at Athens, particularly of Arcesilaus and Carneades.

Probability (prob-a-bil'i-ti), in algebra, the mathematical investigation of chances; the ratio of the number of chances by which an event may happen to the number by which it may both happen or fail. If an event may happen in a ways and fail in b ways, and all these ways are equally likely to occur, the probability of its happening is $\frac{a}{a+b}$, and the probability of its failing is $\frac{a}{a+b}$, 'certainty' being represented by unity. When the probability of the happening of an event is to the probability of its failing as a to b, the fact is expressed in popular language thus — the 'odds' are a to b for the event, or b to a against the event. If there are three events such that one must happen, and only one can happen, and suppose the first event can happen in a ways, the second in b ways, and the third in c ways, and that all these ways are equally likely to occur, then it is evident that the probability of the happening of the first event is $\frac{a}{a+b+c}$, and of its failing $\frac{b+c}{a+b+c}$. Example: Suppose that 3 white balls, 4 black balls, and 5 red balls are thrown promiscuously into a bag, and a person draws out one of them; the probability that this will be white is $\frac{3}{12}$ or $\frac{1}{4}$, the probability that it will be

black is 4/12 or 1/3, the probability that it will be red is 5/12. The theory of probabilities is a complicated and extensive one and has been much utilized in actuarial science; it has also been used in calculating the chances at various games.

Probate Court (prō'bāt) is a tribunal exercising jurisdiction in questions relating to the probate of wills, the administration of property left by intestates, the management of testamentary funds, the guardianship of infants and similar matters. A probate judge is commonly called a surrogate, and in some states the tribunal itself is known as a surrogate's court. The ordinary courts of common law and the probate courts have as a rule concurrent jurisdiction in removing trustees and guardians. In England a probate court was constituted in 1858 which superseded the ecclesiastical courts in matters relating to wills and successions. The Judicature Acts of 1873-75 transferred its jurisdiction to the Probate, Divorce and Admiralty Division of the High Court of Justice.

Probation (prō-bā'shun), in penology a plan whereby criminals or delinquent children are set at liberty by the court under the supervision of a probation officer, who is responsible to the court for the good conduct and progressive reform of the offender. If the latter fails to meet the conditions of the probation he may be brought back to court and consigned to a prison or reformatory. When he fulfills them he is released from probation and becomes a free citizen. The probation system is based on the theory that the reformation of the criminal rather than his punishment is the most effective protection to society, and that in the early stages of criminality reformation is much more probable if the individual is permitted to live under normal conditions with the advice of an intelligent and sympathetic person.

Proboscidea (pro-bo-sid'e-a), an order of mammals distinguished, as implied by this name, by the possession of the characteristic proboscis or trunk. Of this class the elephant alone exists; but there are several extinct animals comprised in it.

Proboscis (pro-bos'is), the term applied to the longer or shorter flexible muscular organ formed by the elongated nose of several mammals. Although seen in a modified degree in the tapirs, etc., the term is more generally restricted and applied to indicate the flexible 'trunk' of the elephant.

Proboscis Monkey, or Nose-Ape (*Larvatus nasalis*), a native of Borneo, distinguished particularly by its elongated nose, its shortened thumbs, and its elongated tail. The general color is a lightish red. These monkeys are arboreal in habits, and appear to frequent the neighborhood of streams and rivers, congregating in troops.

Probus (prō'bus), Marcus Aurelius, one of the ablest of the Roman emperors, was born at Sirmium in the year 232. At an early age Marcus attracted the notice of the Emperor Valerian, by whom, after having distinguished himself by military service, he was placed at the head of a legion; and the brilliancy of his subsequent conduct in the African, Persian, Arabian and Germanic campaigns brought him into still more prominent notice. On the death of the Emperor Tacitus, in 276, the army hailed him as emperor, a selection immediately confirmed by the senate and people of Rome. His chief struggle during his reign was to guard the frontiers of the empire against the barbarians, a task which he carried out with great success both in Europe, Asia, and Africa. He also settled large numbers of barbarians in the frontier provinces, and admitted them to his legions; and devoted himself to the making of roads and draining of marshes. His skilful administration and public virtues did not, however, protect him from enmity; and after a short regin he was murdered in a military insurrection in 282.

Procedure (prō-sē'dūr), Civil, is the method of proceeding in a civil suit throughout its various stages. In the United States, when redress is sought for a civil injury, the injured party brings an *action* against the party whom he alleges has done the injury. The person who raises an action is termed the *plaintiff*, and he against whom the action is brought the *defendant;* in Scotland the terms are *pursuer* and *defender*. It is usual before the suit is commenced for the plaintiff's attorney to acquaint the defendant with the demand of his client, and state that unless complied with legal proceedings will be instituted. Should this not have the desired effect, the action is begun as a rule by issuing against the defendant a *writ of summons*, commanding him to enter *an appearance* in court, failing which an appearance will be entered for him by the plaintiff. (See *Non-appearance.*) When an appearance has been entered both parties to the suit are now said to be *in court*, and judgment may be proceeded with. The next stage is the *pleadings* or the statements in legal form of the

cause of action or ground of defense brought forward by the respective sides. The next stage of precedure after the pleadings is the *issue*, which may be either on matter of law, when it is called a *demurrer*, or on matter of fact, where the fact only is disputed. A demurrer is determined by the judges after hearing argument on both sides, but an issue of fact has to be investigated before a jury, and this is denominated *trial by jury*. (See *Jury and Jury Trials*.) After the judge has summed up to the jury the *verdict* follows and then the *judgment* of the court; where there is no jury, of course, judgment is pronounced by the judge after hearing counsel.

Procellaridæ (pro-sel-lar'i-dē), the petrel family of birds, of which the typical genus is *Procellaria*.

Process (prō'ses), in law, a term applied in its widest sense to the whole course of proceedings in a cause real or personal, civil or criminal.

Processional (prō-sesh'un-al), a service-book of the Roman Catholic Church, for use in religious processions. Some of the processionals of ancient date are very rare and highly valued by book-fanciers.

Procession of the Holy Ghost. See *Holy Ghost*.

Procida (pro'chi-dȧ; anciently, *Prochyta*), an island on the west coast of S. Italy, lying nearly midway between the island of Ischia and the coast of the province of Naples. It is about 3 miles long and 1 mile broad, flat in surface, and fertile. The principal place of the island is Procida, or Castello di Procida, which has a harbor, a castle, and a considerable trade. Pop. 13,964.

Procida, Giovanni da. See *Sicilian Vespers*.

Proclamation (prok-la-mā'shun), a public notice made by a ruler or chief magistrate to the people, concerning any matter which he thinks fit to give notice about. It may consist of an authoritative announcement of some great event affecting the State, but is most commonly used in Britain for the summoning, prorogation, and dissolution of Parliament. A royal proclamation must be issued under the great seal. In the United States the President issues proclamations as to treaties, days of thanksgiving, admission of new States, etc. Proclamations are issued in the United States for election days, the President, Governors, mayors, and sheriffs acting by authority of their offices.

Proclus (prō'klus), a philosopher of the Neo-Platonic school, born at Byzantium in 412; died at Athens in 485. He was educated at Alexandria and Athens and became familiar with all branches of philosophy and theology. As a teacher at Athens he was very successful. His system aimed at the widest comprehensiveness. He not only endeavored to unite all philosophical schemes, but made it a maxim that a philosopher should embrace also all religions by becoming infused with their spirit. In his writings he professes to return to Plato, and to bring down Neo-Platonism from the misty heights to which it was raised by Plotinus. M. Cousin placed him on a level with the most distinguished philosophers of Greece, but this estimate is generally considered extravagant. His extant works include a *Sketch of Astronomy*, in which he gave a short view of the systems of Hipparchus, Aristarchus, and Ptolemy; *The Theology of Plato*, *Principles of Theology*, a *Life of Homer*, etc.

Proconsul and Proprætor, originally, in the ancient Roman system of administration, a consul or prætor whose command (or *imperium*) was prolonged for a particular purpose after his demission of office. In course of time the terms came to be applied to anyone who was entrusted with some special service, and with magisterial authority for the purpose of performing it. Proconsuls and proprætors were generally men who had been consuls or prætors, but were not always so. There were four varieties of proconsul: 1. A distinguished statesman, formerly consul, appointed for a special duty. 2. An individual, who had never been consul, was sometimes created proconsul to be sent on some important mission. 3. A consul occasionally had his *imperium* prolonged, in order to complete some undertaking he had commenced. 4. A consul appointed after his term of office to the government of a province. The proconsuls under the republic had no authority within the walls of Rome, and they lost their *imperium* on entering the city. Under the empire the emperor was always invested with proconsular authority.

Procopius (pro-kō'pi-us), Andrew, a Hussite leader of the fifteenth century. He succeeded Ziska in 1424 as commander of the Taborites, the chief section of the Hussites, and became the dread of the troops of the Emperor Sigismund. He made himself master of a large part of Bohemia, and ravaged Moravia, Austria, and Silesia. His principal military triumphs were the battle of Aussig in 1426, and his campaigns in

Silesia and Saxony in the following year. His expeditions were marked with great courage and slaughter, and with the destruction of many cities, of which Dresden was the chief. In 1431 he gained a great victory over the Elector of Brandenburg, who was in alliance with Sigismund, and in 1433 he appeared with a large following at the Council of Basel, and demanded, in the name of the Hussites, various reforms in religious matters. As the section of the Hussites led by Procopius were not satisfied with the concessions made by the council war was resumed, but Procopius was killed soon after in a battle fought at Böhmischbrod (1434).

Procopius of Cæsarea, a Greek historian, a native of Cæsarea, in Palestine, where he is supposed to have been born about 500 A.D. He first attracted the notice of Belisarius, who appointed him his secretary; and about the year 541 he was appointed by the Emperor Justinian a senator and afterwards (562) prefect of the city. He died at Constantinople about 565 A.D. His works are a history of his own times and a history of the edifices built or repaired by Justinian. A scandalous chronicle of the court of Justinian, entitled *Anecdota*, has also been attributed to him by some writers.

Procrustes (pro-krus'tēz; 'the Stretcher'), a celebrated robber of ancient Greek legend, whose bed is still proverbially spoken of. The legend of him is, that if his victims were too short for the bed, he stretched them to death, while, if they were too tall, he cut off their feet or legs.

Procter (prok'tėr), Bryan Waller, an English poet and prose writer, born about 1789; died at London in 1874. He was educated at Harrow, where he was the schoolfellow of Byron and Peel. His first published work was entitled *Dramatic Scenes and other Poems*, and appeared in 1819 under the pseudonym of Barry Cornwall, which remained Procter's pseudonym in his future writings. This volume being well received, he published shortly thereafter *A Sicilian Story* and *Marcian Colonna*. In 1821 he produced a tragedy, *Mirandola*, which was performed with great success at Covent Garden. Procter also wrote several other books of poetry and a variety of prose works; the most interesting of these latter being a *Memoir of Charles Lamb*, of whom he was an intimate personal friend. Procter's poems exhibit much delicate grace and refinement, but have never attained great popularity. He was called to the bar in 1831, and for many years held the post of a commissioner in lunacy, which, however, he resigned in 1860.— His daughter, Adelaide Anne, born in London in 1825; died in 1864, was a poetess of some note. Her songs and hymns show much taste and feeling, but she never attempted anything on a large scale. Her best-known volume is *Legends and Lyrics*, published in 1858.

Proctor (from the Latin *procurator*), a person who in the ecclesiastical and admiralty courts in England performs the duties of an attorney or solicitor. The proctors were formerly a distinct body, but any solicitor may now practice in these courts. The queen's proctor is a crown official charged with the duty of conserving the public interests in certain classes of private lawsuits. In the Universities of Oxford and Cambridge the proctors are two officers chosen from among the masters of art, whose office is to preserve discipline.

Proctor, Redfield, statesman, was born at Proctorsville, Vermont, in 1831; died in 1908. He was elected to the legislature of Vermont in 1867, lieutenant-governor in 1876, and governor in 1878. He was made Secretary of War by President Harrison in 1889, and was elected United States Senator for Vermont in 1891.

Proctor, Richard Anthony, an English astronomer, born at Chelsea in 1837, and educated at King's College, London, and Cambridge University. Having devoted himself specially to the study of astronomy, he published a number of valuable works on the subject, including *Saturn and its System*, *Handbook of the Stars*, *Half Hours with the Telescope*, *Half Hours with the Stars*, *Other Worlds than Ours* (a very popular work), *Light Science for Leisure Hours*, etc. He died in 1888, in the United States. In 1893 a monument was erected to his memory by George W. Childs in Greenwood Cemetery.

Procurator (prok'ū-rā-tur), among the ancient Romans, a provincial officer who managed the revenue of his province. In some of the small provinces, or in a part of a large province, the procurator discharged the office of a governor, and had the power of punishing capitally, as was the case with Pontius Pilate in Judæa, which was attached to the province of Syria.

Procurator-fiscal, in Scotland, an officer appointed to act as the public prosecutor in criminal cases before the sheriff, magistrates, or justices of the peace belonging to his district. He is allowed to practice privately as a lawyer also. When infor-

mation of a crime committed within a procurator-fiscal's district has been laid before him, it is his business to ascertain the truth of the charge, to obtain a warrant for the apprehension of the accused, to see that the warrant is carried out, and in general to do whatever else is necessary to protect the innocent, and bring to justice the guilty. All precognitions of witnesses are taken by him before the sheriff or sheriff-substitute of the district. The procurator-fiscal has also, in conjunction with the sheriff, to discharge the duties of a coroner in making investigations with regard to persons who are suspected to have died from other than natural causes. The duties are somewhat similar to those of district attorneys in the United States.

Procyon (prō'si-on), the genus of animals to which the raccoon belongs.

Producer-gas (prō-dū'sėr). When a limited stream of air is driven through glowing coke, carbonic acid gas first arises from the coke, the oxygen of the air being consumed. As this passes through the coke it takes up new carbon and is largely converted into carbonic oxide. There results a gaseous mixture composed of about 26 per cent. of carbonic oxide, 70 per cent. of nitrogen from the air employed, and 4 per cent. of carbonic acid. This mixture is combustible, burning with a clear flame, and under the name of producer-gas is largely employed in various processes. The gas from the producer is very hot, and if passed at once into the furnace a large proportion of the heat of the coke may be utilized; if allowed to cool, a large percentage of the heat is lost. Coal yields about 160,000, coke about 175,000 cubic feet of this gas per ton. If steam be mixed with the air driven through the coke hydrogen is added to the gases produced, and the heating value is higher than in the former case.

Production, Cost of, a phrase used in political economy, not always in the same sense even by the same writer. The confusion generally arises from a want of clearness in distinguishing between cost and expenses of production. The cost of production in its original meaning signifies the amount of inconveniences and exertions necessary for the production of any commodity. Used as equivalent to expenses of production, it signifies the wages and profits expended on the production of the article. It is the ultimate basis of value of articles which can be indefinitely multiplied, and regulates the minimum value of articles which are limited in quantity.

Profession (pro-fesh'un), the act of taking the vows by the member of a religious order after the novitiate is finished. See *Monastic Vows.*

Professor (pro-fes'ur), a term applied in the United States to salaried teachers in universities and similar institutions who are appointed to deliver lectures for the instruction of students in some particular branch of learning. In Oxford and Cambridge, England, the professors, and the instruction which they convey by lectures, are only auxiliaries instead of principals, the necessary business of instruction being carried on by the tutors connected with the several colleges. In the universities of Scotland and Germany, on the other hand, the professors are at once the governing body and the sole recognized functionaries for the purposes of education.

Profit (prof'it), the gain resulting to the owner of capital from its employment in buying and selling, in manufacturing, or in any commercial undertaking.— *Net profit* is the difference in favor of a seller between the selling price of commodities and the original cost after deducting all charges.— The *rate of profit* is the proportion which the amount of profit derived from an undertaking bears to the capital employed in it.— *Profit and loss*, the gain or loss arising from goods bought or sold, or from any other contingency. In *bookkeeping* both gains and losses are titled *profit and loss*, but the distinction is made by placing the former on the creditor side, and the latter on the debtor side.

Profit-sharing, a system now adopted in many manufacturing and mercantile establishments, by which a certain percentage of the annual profits is divided among the employés. It is argued that this system, by giving the employés an interest in the prosperity of the establishment, increases the quality and quantity of the product, and lessens the danger of strikes and labor disputes generally. While recognized as a desirable principle by Targat in 1775, it was first put in practical operation in 1842 by Leclaire, a prosperous painter and decorator of Paris. It proved in his case highly successful, and also in several other French establishments. Of recent years it has been somewhat widely adopted in the United States, Great Britain, France, Switzerland and elsewhere, and has proved as a rule very advantageous.

Prognathic (prog-nath'ik), or Prognathous, in ethnology, a term applied to the skull of certain races of men in whom the jaw slants

forwards by reason of the oblique insertion of the teeth. See *Facial Angle.*

Prognosis (prog-nō'sis), in medicine, the prejudgment of the physician regarding the probable course and result of a disease.

Progression (pro-gresh'un), in mathematics, a regular or proportional advance in increase or decrease of numbers. In *arithmetical progression* terms increase or decrease by equal differences, as, 2, 4, 6, 8, 10, and 10, 8, 6, 4, 2. In *geometrical progression* terms increase or decrease in a certain constant ratio, as 2, 4, 8, 16, 32, 64, and 64, 32, 16, 8, 4, 2, or, generally, a, ar, ar^2, ar^3, ar^4, etc.

$$a, \frac{a}{r}, \frac{a}{r^2}, \frac{a}{r^3}, \frac{a}{r^4}, \text{ etc.},$$

where a is the first term, and r the common ratio in the one case, and $1 \div r$ the common ratio in the other.

Progressive Party, a new political party organized in the United States in 1912. At meetings held in Chicago, June 22-23, 1912, part of the progressive forces at the Republican National Convention formed a new party. A more representative convention was assembled in August, in which Roosevelt was nominated for president and Hiram W. Johnson for vice-president. The party was defeated in the ensuing election. In 1916 it again nominated Theodore Roosevelt, but on his declination it accepted the candidate of the Republican party.

Prohibition, the forbidding by law of the manufacture or sale of alcoholic liquors for beverages. The first prohibition state was Maine (1846). By the end of 1917 full prohibition was in force in half the states and partial prohibition in others. In December, 1917, Congress submitted to the several states for ratification a constitutional amendment prohibiting the manufacture, sale, transportation, import or export of intoxicating beverages, the amendment to become law on the approval within seven years of three-fourths of the states of the Union, or 36 states. The first state to ratify the amendment was Mississippi; Nebraska was the thirty-sixth state to ratify, on January 16, 1919, on which date Missouri and Wyoming also ratified. The amendment was certified January 29, 1919, and took effect January 16, 1920. (See *United States—Constitution.*)

Prohibition Party, an American political party organized at Chicago in 1869 as an outcome of the movement against intoxicating liquor

Projec'tiles, Theory of, is that branch of mechanics which treats of the motion of bodies thrown or driven some distance by an impelling force, and whose progress is affected by gravity and the resistance of the air. The most common cases are the balls projected from cannon or other fire-arms. If thrown horizontally, the body will move in a curved path, because it retains unchanged (leaving out of account the resistance of the air) its horizontal velocity, while it falls faster and faster towards the ground. A body projected obliquely has initially a certain horizontal velocity and a certain vertical velocity. It retains its horizontal velocity unchanged, but its vertical velocity is altered by the force of gravity, and in both of these cases we find that the path of the projectile is a parabola. With a given velocity the greatest range of a projectile is obtained by projecting at an angle of 45° with the vertical. The actual path of a bullet is always within the parabola of the theoretical projectile, and hence the range of a gun is much less than what the parabola would give. The range depends also upon the shape and weight of the projectile and there is also its initial velocity to be taken into consideration. See *Gunnery.*

Projection (pro-jek'shun), the representation of something by means of lines, etc., drawn on a surface, especially the representation of any object on a perspective plane, or such a delineation as would result were the chief points of the object thrown forward upon the plane, each in the direction of a line drawn through it from a given point of sight or central point. This subject is of great importance in the making of maps, in which we have to consider the projection of the sphere or portions of it. Projections of the sphere are of several kinds, according to the situations in which the eye is supposed to be placed in respect of the sphere and the plane on which it is to be projected. See *Map.*

Prolapsus Ani (prō-lap'sus ā'ni), the protrusion of the lower part of the rectum through the anus, caused by straining in costiveness, piles, etc. Persons liable to this accident should be careful to regulate their bowels so as to prevent costiveness and consequent straining. Regular bathing of the parts with cold water may also be found useful.

Prolapsus Uteri (ū'tėr-i), 'falling down of the womb,' or 'bearing down,' a common affection among women who have borne large families, but sometimes occurring

in virgins, and in very rare cases in infants. What renders the falling down of the womb possible is a general laxity of the parts supporting it, and it may be of various degrees, from the slightest downward displacement to such a descent as causes external protrusion of the womb. When the falling down once begins it always tends to increase, unless means are taken to prevent it. In all cases of this affection the first requisite for cure is prolonged rest in the horizontal position, with the use, under surgical direction, of cold or astringent injections and the various forms of pessary.

Proletarii (prō-le-tā′ri-i), the name which was given to those Roman citizens who, in the classification of their means by Servius Tullius, stood in the sixth or lowest class. The term has been revived in modern times as a designation of the lowest class of the community; but more frequently the collective appellation *proletariat* is used. A *proletarian* is a member of the proletariat.

Prologue (prō′log), the preface or introduction to a dramatic play or performance. It may be either in prose or verse, and is usually pronounced by one person. Prologues sometimes relate to the drama itself, and serve to explain to the audience some circumstances of the action, sometimes to the situation in which the author or actor stands to the public, and sometimes have no immediate connection with either of these persons or subjects.

Prome (prōm), a town of Lower Burmah, capital of a district of same name, is situated on the Irrawaddy. It is a large town surrounded by a wall, with extensive suburbs, and, owing to the flat ground on which it is built, it is liable to be inundated by the river. It has a splendid pagoda which attracts many Buddhist pilgrims. There are manufactures and an active trade. Pop. 27,375.

Promerops (prom′e-rops), a genus of insessorial birds, many of which are remarkable for the beauty of their plumage. They have a longish bill, an extensible tongue, and feed upon insects, soft fruits, and the saccharine juices of plants. One species, *P. superba*, is a native of New Guinea; another, *P. erythrorhynchus*, is a native of Africa.

Prometheus (prō-mē′thūs), in Greek mythology, one of the Titans, brother of Atlas and of Epimetheus, and the father of Deucalion. His name means 'forethought,' as that of his brother Epimetheus signifies 'afterthought.' He gained the enmity of Zeus by bringing fire from heaven to men, and by conferring other benefits on them. To punish this offense Zeus sent down Pandora, who brought all kinds of diseases

Promerops superba.

into the world. He caused Prometheus himself to be chained by Hephæstus (Vulcan) on a rock of the Caucasus (the eastern extremity of the world, according to the notions of the earlier Greeks), where his liver, which was renewed every night, was torn by a vulture or an eagle. He was ultimately delivered by Heracles, who destroyed the vulture, unlocked the chains, and permitted Prometheus to return to Olympus. That is the tradition as shaped by Æschylus, who has a noble tragedy on the subject, the *Prometheus Vinctus* ('Prometheus Bound'), while Shelley has also a drama, the *Prometheus Unbound*. A different version is given by Hesiod.

Promise (prom′is), in law, an engagement entered into by one person to perform or not perform some particular thing. When there is a mutual promise between two parties it is termed a contract. A promise may either be verbal or written. A verbal promise is in the United States called a promise by parole, and a written promise is in technical language there called a covenant. By English law no promise is binding unless it was made for a consideration, but by Scotch law it is always binding, whether a consideration was given or not.

Promissory Note. See *Bill.*

Prompter (promp′tėr), one placed behind the scenes in a theater, whose business is to assist the actors when at a loss, by uttering the first words of a sentence or words forgotten.

Prong-buck, or PRONG-HORN ANTELOPE, a species of ante-

lope, the *Antilocapra Americana*, or *A. furcifer*, which inhabits the western parts of the United States. It frequents the plains in summer and the mountains in winter. It is one of the few hollow-horned antelopes, and the only living one in which the horny sheath is branched, branching being otherwise peculiar to deer which have bony antlers.

Pronoun (prō'noun), in grammar, a word used instead of a noun or name, or used to represent an object merely in relation to the act of speaking; thus it neither designates its object in virtue of the qualities possessed by it, nor always designates the same object, but designates different objects according to the circumstances in which it is used. The *personal pronouns* in English are *I*, *thou* or *you*, *he*, *she*, *it*, *we*, *ye*, and *they*. The last is used for the name of things, as well as for that of persons. *Relative pronouns* are such as relate to some noun going before, called the antecedent; as the man *who*, the thing *which*. *Interrogative pronouns* are those which serve to ask a question, as *who? which? what? Possessive pronouns* are such as denote possession, as *my*, *thy*, *his*, *her*, *our*, *your*, and *their*. *Demonstrative pronouns* are those which point out things precisely, as *this*, *that*. *Distributive pronouns* are *each*, *every*, *either*, *neither*. *Indefinite pronouns* are those that point out things indefinitely, as *some*, *other*, *any*, *one*, *all*, *such*. Possessive, demonstrative, distributive, and indefinite pronouns, having the properties both of pronouns and adjectives, are commonly called *adjective pronouns* or *pronominal adjectives*.

Pronunciamento (prō-nun-si-a-men'tō), in Spain and Spanish America, a proclamation against the existing government, intended to serve as a signal of revolt.

Proof (pröf). See *Evidence*.

Proof Impression, in printing, a rough impression from types, taken for correction. A first proof is the impression taken with all the errors of workmanship. After this is corrected another impression is printed with more care to send to the author: this is termed a *clean proof*. When this is corrected by the author, and the types altered accordingly, another proof is taken and carefully read over: this is called the *press proof*. In engraving, a proof impression is one taken from an engraving to show the state of it during the progress of the work; also, an early impression, or one of a limited number, taken before the letters to be inserted are engraved on the plate. Proof states of engravings are usually distinguished as (1) *Artists' Proofs*, with no engraved title, sometimes signed in pencil by the painter or engraver, or both. *Remarque* artists' proofs have some mark, frequently a minute part left white, or a design slightly engraved on the margin. (2) *Proofs before Letters*, still without title, but with artist's and engraver's names inserted close to the bottom of the work, and the publisher's name near the lower margin of the plate. (3) *Lettered Proofs*, with title engraved lightly in such a manner as to be easily erased, or in open letters ready for shading, when the title is finally put on the plate for the ordinary impressions.

Proofreading. The reading of printed matter for correction, the necessary corrections being made on the margin of the proof-sheet, an established set of signs being used. It is the purpose of the proofreader to make the printed matter conform to the author's MSS., but as this frequently needs correction, a good proofreader will endeavor to correct errors or inconsistencies due to the author. Several readings are necessary to yield a good result, one of these being usually made by the author. A final revision is made to see if all the corrections have been made by the compositor. See *Correction of the Press*.

Propaganda (prop-a-gan'da), an association, the congregation *de propaganda fide* (for propagating the faith), established at Rome by Gregory XV in 1622 for diffusing a knowledge of Roman Catholicism throughout the world, now charged with the management of the Roman Catholic missions. In close connection with it stand the seminaries or colleges of the Jesuits, and the great majority of the members of the propaganda are Jesuits and Franciscans.

Propagation (prop-a-gā'shun), the multiplication or continuation of the species of animals or plants. As a technical term it is used chiefly in regard to plants. The most common method of propagating plants is of course by their seed. There are other ways, however, by which plants are propagated naturally. Some, for example, throw off runners from their stems which creep along the ground, and these runners take root at the buds, and send up new plants. The commonest artificial methods of propagating plants are budding, layering, the various forms of grafting, including inarching or grafting by approach, propagation by offsets and by slips. Some plants (as the potato) are propagated by dividing the tubers or underground stems, each 'eye' or leaf-bud of which sends

up a new plant, while a few are propagated by cuttings of the leaves.

Propeller. See *Screw-Propeller.*

Propertius (prō-per'she-us), SEXTUS AURELIUS, a Latin elegiac poet, the date of whose birth is variously given as 57 and 46 B.C. After the end of the civil war he found a patron at Rome in Mæcenas; obtained the favor of the emperor; devoted himself to poetry; became the bosom friend of Ovid; lived mostly in Rome, and died there about 12 B.C. His elegies, of which we have four books, are not so highly esteemed as those of his friends Ovid and Tibullus.

Property Tax (prop'ėr-ti), a rate or duty levied by the State, county, or municipality on the property of individuals, the value of the property being fixed by assessment.

Prophets (prof'etz), among the Hebrews, inspired teachers sent by God to declare his purposes to his people. The ordinary Hebrew word for a prophet is *nâbhi*, generally interpreted as 'one who pours forth or announces.' There are two other words applied to the prophets, namely, *roëh* and *chozeh*, both of which literally signify seer, and are uniformly so translated in the Authorized Version of the Scriptures. In the Septuagint the word *nâbhi* is always rendered *prophētēs*, and in the Authorized Version *prophet*. The literal signification of the Greek word *prophētēs* is 'one who speaks for another'; but the word was generally used as meaning 'one who speaks for or interprets the will of a god.' In the common acceptation of the word its sense has become narrowed to that of a 'foreteller of future events,' but the wider acceptation still remains side by side with this narrower one. From the time of Samuel frequent mention is made of a body of men bearing the general name of prophets. They were members of a school in which young men of all the tribes were instructed in the law, and apparently also in sacred poetry and music. The first school of this nature appears to have been set up by Samuel at Ramah, and there is mention of others at Bethel, Jericho, Gilgal, and elsewhere. It is probable that these schools of the prophets were formed to strengthen the attachment of the Jews to their religion, and to maintain that religion pure. The prophetic order seems to have continued in existence down to the close of the Old Testament canon. Sixteen of them are the writers of books that are admitted into the Old Testament canon. These may be divided into four groups in such a manner as to give us a partial chronological arrangement. First, there are three prophets who belong to the Kingdom of Israel as distinct from that of Judah — Hosea, Amos, Jonah; secondly, there are eight prophets of the Kingdom of Judah — Joel, Isaiah, Jeremiah, Obadiah, Micah, Nahum, Habakkuk, Zephaniah; thirdly, two prophets of the captivity — Ezekiel and Daniel; and fourthly, three prophets of the return — Haggai, Zechariah, and Malachi. To the first group belong also Elijah and Elisha, the two great prophets, who are not the authors of any books in the canon. The chief function of the prophetic order was to maintain the Mosaic theocracy in its purity, and the patriotism which strongly characterizes all the Hebrew prophets was closely connected with their religious zeal. The Jewish people being the chosen of God and the immediate subjects of the divine ruler, it is the constant cry of the prophets that the people should turn to righteousness in order to be delivered from the hands of their enemies. The predictive powers of the prophets have been the occasion of much controversy. The ability of the prophets to foretell the future was generally believed in by the Jews, and in one passage of the Old Testament, Deut., xviii, 22, is made a negative test of the justness of a person's claim to be a prophet. The main controversies with regard to this predictive power turn upon two points — first, the reality of the power, which is by some altogether denied; and, secondly, the reference of the prophecies. With regard to the reference of the prophecies the chief controversy is connected with the prophetical writings of the Old Testament supposed to relate to the Messiah Regarding these prophecies three different positions are taken up by different schools of Biblical critics. Those who deny to the prophets the power of foretelling future events altogether necessarily deny also the reference of the prophecies in question to Christ as the Messiah. Another school, while admitting the reference of at least some of the passages to historical events, contend that in their secondary meaning they have also a reference to the Messiah. The third school hold undeviatingly to the theory that none but the Messianic interpretation is permissible.

Propolis (prop'u-lis), a red, resinous, odorous substance having some resemblance to wax, collected from the viscid buds of various trees by bees, and used by them to stop the holes and crevices in their hives to prevent the entrance of cold air, to strengthen the cells, etc.

Propontis (prō-pon'tis), the ancient name of the Sea of Marmora, from being before or in advance of the Pontus Euxinus or Black Sea.

Proportion (pro-pōr'shun), in mathematics, the equality or similarity of ratios, ratio being the relation which one quantity bears to another of the same kind in respect to magnitude; or proportion is a relation among quantities such that the quotient of the first divided by the second is equal to the quotient of the third divided by the fourth. Thus 5 is to 10 as 8 is to 16; that is, 5 bears the same relation to 10 as 8 does to 16. Proportion is expressed by symbols, thus: — $a : b :: c : d$, or $a : b = c : d$, or $\frac{a}{b} = \frac{c}{d}$. The above is sometimes called *geometrical proportion* in contradistinction to *arithmetical proportion*, or that in which the difference of the first and second is equal to the difference of the third and fourth. *Harmonical* or *musical proportion* is a relation of three or four quantities such that the first is to the last as the difference between the first two is to the difference between the last two; thus 2, 3, 6 are in harmonical proportion, for 2 is to 6 as 1 is to 3. *Reciprocal* or *inverse proportion* is an equality between a direct and a reciprocal ratio, or a proportion in which the first term is to the second as the fourth is to the third, as $4 : 2 :: 3 : 6$ inversely, that is as $\frac{1}{3} : \frac{1}{6}$.

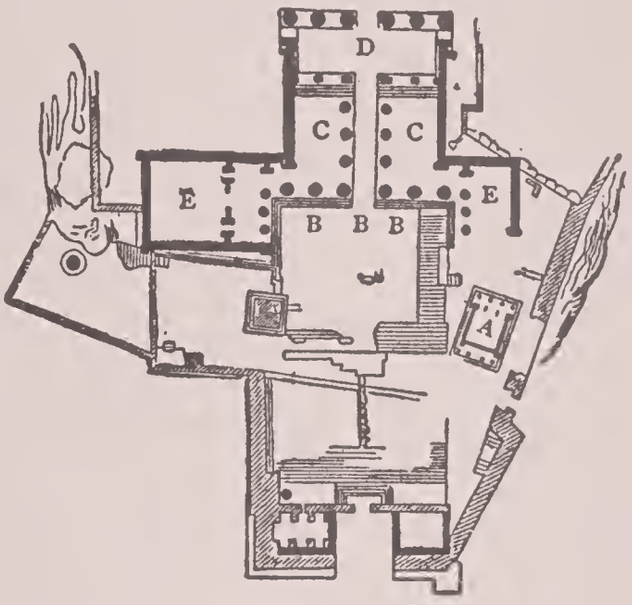
Proportional Compasses. See *Compasses.*

Proportional Representation, in politics, a system of representation by which political parties are represented according to their numbers, and not in such a manner as that the majority elects all the representatives. Two plans for securing proportional representation have been tried, the one being by providing that voters shall only vote for a proportion of the representatives, say two out of three, or half when the number is even; the other being to give each elector a vote for every one of the representatives, those with the highest votes being elected according to the number each party is entitled to in proportion to the total vote cast.

Proposition, in grammar and logic, a sentence or part of a sentence consisting of a subject and a predicate, and in which something is affirmed or denied of a subject. Logical propositions are said to be divided, first, according to substance, into *categorical* and *hypothetical;* secondly, according to quality, into *affirmative* and *negative;* thirdly, according to quantity, into *universal* and *particular.*

Proprætor. See *Prætor, Proconsul.*

Propylæa (prop-i-lē'a), in Greek architecture, the entrance to a temple. The term was employed particularly in speaking of the superb vestibules or porticoes conducting to the Acropolis of Athens. This magnificent



The Propylæa, Athens.

A, Temple of Nikè. B, Gateway. C, Court. D, Posticum. E, Wing buildings.

work, of the Doric order, was constructed under the direction of Pericles (B.C. 437-433) after the designs of Mnesicles, one of the most celebrated architects of his age.

Propylon. See *Pylon.*

Prorogation of Parliament, the continuance of parliament from one session to another. Parliament is prorogued by the sovereign's authority, either by the lord-chancellor in the royal presence, or by commission, or by proclamation.

Proscenium (prō-sē'ni-um), the part in a theater from the curtain or drop-scene to the orchestra; also applied to the curtain and the ornamental framework from which it hangs. In the ancient theater it comprised the whole of the stage.

Proscription (pro-skrip'shun), in Roman history, a mode of getting rid of enemies, first resorted to by Sulla in 82 B.C., and imitated more than once afterwards in the stormy years that closed the republic. Under Sulla,

lists of names were drawn out and posted up in public places, with the promise of a reward to any person who should kill any of those named in the lists, and the threat of death to those who should aid or shelter any of them. Their property also was confiscated, and their children were declared incapable of honors.

Prose (prōz), ordinary spoken or written language, untrammeled by poetic measure, and thus used in contradistinction to *verse* or *poetry*. The true character of prose can be clearly conceived only by considering it in relation to poetry. The two chief states of the inward man may be called the *thinking* and the *poetical* states, and depend upon the predominance of the understanding, or the imagination and feelings. If we think (in the narrower sense of the word) we combine ideas according to the laws of reason; and prose, which is the language of sober thought, is characterized by the abstractness and precision belonging to ideas that occupy the understanding. Artistic and finished prose is among the latest attainments both of nations and individuals, and it would appear that with most nations classical prose writers are fewer than classical poets.

Prosecution (pros-e-kū'shun), CRIMINAL. The law of America and of England differs from that of other countries in having no office analogous to what is termed in France *ministére public* for the prosecution of offenses. At common law, therefore, and in the great majority of cases, the so-called *prosecutor* is merely the person injured by an offense, who in the first instance obtains a summons or warrant against the accused. The result of this is that many criminals are allowed to go free merely because there is no prosecutor.

Proselyte (pros'e-līt; Greek, *prosēlytos*, a stranger or newcomer), a person who leaves one religion for the profession of another. The Jews, in New Testament times at least, had two classes of proselytes, namely, the 'proselytes of the gate,' as they were termed; and the 'proselytes of righteousness,' or of the covenant. According to the rabbis, the proselytes of the gate were those who renounced idolatry and worshiped the only true God according to the (so-called) seven laws of the children of Noah, without subjecting themselves to circumcision and the other commands of the Mosaic law. The proselytes of righteousness were persons who had been fully converted from paganism to Judaism, had been circumcised, and bound themselves to observe the Mosaic law.

Proserpine (pros'er-pīn). See *Persephonē*.

Prosimiæ (pro-sim'i-ē), a name applied to the lemurs and their allies.

Prosobranchiata (pros-u-brank'i-a-ta), an order of gasteropods comprising the whelks, periwinkles, etc., mostly marine, though some inhabit fresh water.

Prosody (pros'u-di), that part of grammar which treats of the quantity of syllables, of accent, and of the laws of versification. Though chiefly restricted to versification, it may also be extended to prose composition. In the Greek and Latin languages every syllable had its determinate length or quantity, and verses were constructed by systems of recurring feet, each foot containing a definite number of syllables, possessing a certain quantity and arrangement. The versification of modern European languages, in general, is regulated mainly by accent and number of syllables, though the weight or otherwise the quantity of syllables has also to be taken into account if harmonious verse is to be produced.

Prosopis (pro-sō'pis), a genus of tropical leguminous trees of the suborder Mimoseæ, having their pods filled between the seeds with a pulpy or mealy substance. Some of them yield useful products, as resin or tannin, food for cattle, etc. See *Mesquite*, *Algarobilla*.

Prosopopœia (pros-o-po-pē'ya), a figure in rhetoric by which things are represented as persons, or by which things inanimate are spoken of as animated beings, or by which an absent person is introduced as speaking, or a deceased person is represented as alive or present. It includes *personification*, but is more extensive in its signification.

Prosper of Aquitaine, a Christian writer who lived during the early part of the fifth century, but of whom little is personally known. A large part of his life seems to have been spent at Marseilles, where he was connected with an ascetic order. It was here that he wrote his polemical poem *Adversus Ingratos*, and it is supposed that he finished his *Chronicon Consulare* (a continuation of Jerome's chronicle) at Rome about 455.

Prossnitz (prōs'nitz), a town of Austria, in Moravia, 11 miles S. S. W. of the town of Olmütz. It has manufactures of woolens and linen cloth and one of the largest corn-markets in Moravia. Pop. (1910) 34,100.

Prostate Gland (pros'tāt), a reddish glandular mass, situated in the pelvic cavity, and which surrounds the neck of the bladder and urethra in males. It is liable to enlargement, especially in old age, and is often the seat of various diseases.

Prostyle (prō'stīl), in architecture, applied to a portico in which the columns stand out quite free from the wall of the building to which it is attached; also applied to a temple or other structure having pillars in front only.

Plan of Prostyle Temple.

Protagoras (prō-tag'o-ras), a Grecian philosopher, born at Abdera, in Thrace, apparently about 480 B.C. He was the first to assume the title of Sophist, and as such he taught principally at Athens. In 411 B.C. he was accused of atheism, for beginning one of his works (*Peri Theōn* — Concerning the Gods) with the words, 'Respecting the gods, I am unable to know whether they exist or do not exist.' He seems to have died soon after, perhaps in the same year. He was the author of a large number of works, all of which are lost.

Proteaceæ (prot-e-ā'se-ē), a natural order of arborescent apetalous exogens, chiefly natives of Australia and the Cape Colony. They are shrubs or small trees, with hard, dry, opposite or alternate leaves, and often large heads of showy and richly-colored flowers, which render them favorite objects of cultivation. The typical genus *Protea* is African and contains numerous species. *Banksia* is a well-known Australian species bearing the popular name of honeysuckle.

Protection (pro-tek'shun), a term applied in economics to an artificial advantage conferred by a government or legislature on articles of home production, either by means of bounties or (more commonly) by duties imposed on the same or similar articles introduced from abroad. Such duties may be simply *protective*, that is, such as that the foreign and home articles can compete in the market on nearly equal terms: or *prohibitory*, that is, such as to exclude foreign competition altogether. The principle of protection has long been applied in the United States, as one of the main elements of Republican party politics, as opposed to the dogma of tariff for revenue only, maintained by the Democratic party. Of late years, however, the distinction in this respect between the policies of the two parties is much less pronounced than of old, and the tariff has become a less exclusive party issue than formerly. See *Free-trade*.

Protector (pro-tek'tur), a title conferred on several occasions by the English parliament upon those appointed to act as regents, generally during the minority of the king. Among those who have held this office are Richard, duke of York (1454); Richard, duke of Gloucester (1483); and the Duke of Somerset (1547). In 1653 the title of lord-protector was bestowed upon Cromwell, as the head of the Commonwealth of England, and after his death (1658) his son Richard also held the title for a short period.

Proteins (formerly called PROTEIDS) are a large and important group of substances which constitute the most essential part of living protoplasm. Proteins are found in all tissues, both animal and vegetable; and they are a necessary ingredient in the food, for without some protein constituent in the food there could be no repair of the waste of the body and no building up of new tissue. The other organic ingredients of human food (the Carbohydrates and the Fats) consist of three elements only, *viz.*, Carbon, Hydrogen, and Oxygen; and are, moreover, comparatively simple in structure. The Proteins contain Carbon, Hydrogen, Oxygen, Nitrogen, and Sulphur, and occasionally Phosphorus, Iron, Iodine, or some other element. The proportion of these elements varies in the different proteins, but the average percentage composition may be given as follows:

Carbon	50	to 55	per cent.
Hydrogen	6.5	to 7	"
Oxygen	20	to 25	"
Nitrogen	15	to 17.5	"
Sulphur	0.3	to 2	"

The proteins are very complex in structure, and the constitution of the protein molecule is still unknown. The proteins have very high molecular weights, some of them being calculated at over 15,000.

The proteins differ very much in their physical properties; they are amorphous, indiffusible substances, belonging to the class of substances known as colloids. Some of them are soluble in water, some in weak salt solutions, some in alcohol, and some in dilute acids or alkalies.

The classification of the proteins is unsatisfactory; not so many years ago al-

most every writer, chemist, and physiologist had his own classification; now, fortunately, there are but two classifications which are recognized by English-speaking students, and these are known as the American and the British classifications. These two classifications are as follows:

AMERICAN CLASSIFICATION.

1. Simple proteins: Albumins; Globulins; Glutelins; Prolamins; Albuminoids; Histons; Protamines
2. Conjugated proteins: Glycoproteins; Nucleoproteins; Phosphoproteins; Hemoglobins; Lecithoproteins
3. Derived proteins:
   - Primary proteins: Proteins; Metaproteins; Coagulated proteins
   - Secondary proteins: Proteoses; Peptones; Peptides

BRITISH CLASSIFICATION.

1. Simple proteins: Protamines; Histones; Albumins; Globulins; Glutelins; Alcohol-soluble proteins; Scleroproteins; Phosphoproteins
2. Conjugated proteins: Glucoproteins; Nucleoproteins; Chromoproteins
3. Products of protein hydrolysis: Infraproteins; Proteoses; Peptones; Polypeptides

When proteins are acted on by acids, or alkalies, or enzymes, they undergo hydrolytic cleavage and give rise to simpler bodies. The complex protein molecule gradually gives place to a less complex body, and this in turn to another still less complex, till the group known as amino-acids is reached. No less than eighteen of these amino-acids have been found during the process of digestion. The enzymes pepsin (in the gastric juice) and trypsin (in the pancreatic juice) acting on the protein taken in as food, produce the following substances: Proteoses, peptones, polypeptides, and then amino-acids. As it is from these amino-acids that the tissues of the body are built up, proteins are considered, from a physiological standpoint, as consisting of various groupings of amino-acids.

Owing to the great complexity of the proteins and the various groupings of the amino-acids, it will be apparent that there will be great variation in the chemical reactions given by these bodies. The chief tests are the color reaction (such as Millon's, the xanthroproteic, and the biuret reactions), and precipitation tests.

Protestant Episcopal Church.

For the origin and early development of this church see *England, Ecclesiastical History.* Its origin in the United States reaches far back into the sixteenth century, when it was established in Virginia, and afterwards made its way into some of the other colonies, although it was not formally organized until 1785. Its doctrinal symbol in this country is the Thirty-nine Articles of the Church of England, slightly altered. The legislative authority is vested in a general convention, which meets triennially, consisting of a house of bishops and a house of clerical and lay deputies. Each diocese has a convention consisting of the clergy and lay representatives, having power to legislate in diocesan matters not regulated by the general canons of the church. At the general convention of 1919 the government of the church was reorganized through the appointment of the body to be known as 'the presiding bishop and council,' which shall have the executive charge of the affairs of the church during the intervals between general convention. Each of the hitherto independent boards in the church was abolished and reorganized as a department of the new council. The General Theological Seminary of the Protestant Episcopal Church, in New York, was established in 1817. Other theological schools and seminaries of the church are at Philadelphia, Chicago, Middletown, Conn., Cambridge, Mass., Alexandria, Va., and elsewhere. In 1919 there were 1,085,068 communicants, and 5960 clergy.

Protestants (prot'es-tants), a name given to the party who adhered to Luther during the Reformation in 1529, and protested against, or made a solemn declaration of dissent from, a decree of the emperor Charles V and the diet of Spires, and appealed to a general council. The protesting members were the electors John of Saxony and George of Brandenburg, Princes Ernest and Francis of Brunswick-Lüneburg, Philip, landgrave of Hesse, and Wolfgang, prince of Anhalt, together with fourteen imperial cities, the chief of which were Strasburg, Nürnberg, Ulm, and Con-

stance. (See *Reformation.*) The name is now applied generally to those Christian denominations that differ from the Church of Rome and that sprang from the Reformation.

Proteus (prō'tē-us), in classical mythology, a marine deity who fed the flocks (seals) of Poseidōn (Neptune) in the Ægean Sea. He is represented as a soothsayer who prophesied only when compelled by force and art, and who tried every means to elude those who consulted him, and changed himself, after the manner of the sea gods, into beasts, trees, and even into fire and water.

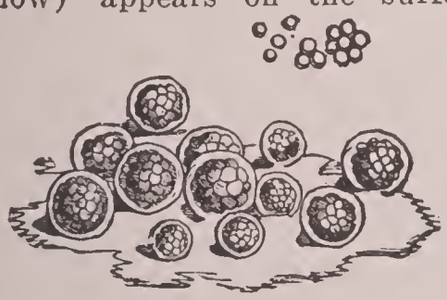
Proteus, a genus of perennibranchiate batrachians. One species only has been hitherto discovered, namely, the *Proteus anguīnus*, which is found in subterranean lakes and caves in Illyria and Dalmatia. It attains a length of about 1 foot. The body is smooth, naked, and eel-like, the legs four in number,

Proteus anguīnus.

small and weak, the forefeet three-toed, the hinder four-toed, and, in addition to permanent external gills, it possesses lungs in the form of slender tubes. From its inhabiting places devoid of light the power of vision is unnecessary, and in point of fact its eyes are rudimentary and covered by the skin.

Prothonotary (pro-thon'a-tā-ri), a term for certain functionaries connected with the papal court who receive the last wills of cardinals, etc. In some of the United States the name of prothonotary is given to the principal clerk of some of the courts.

Protococcus (prō-to-kok'us), a genus of algæ. *P. nivālis* (red-snow) appears on the surface of



Protococcus nivālis (Red-snow), magnified and natural size.

snow, tingeing extensive tracts in the Arctic regions or among the Alps, in an incredibly short space of time, with a deep crimson. This plant, which may be regarded as one of the simplest forms of vegetation, consists of a little bag or membrane forming a cell. A large number of these are commonly found together, but each one is separate from the rest, and is to be regarded as a distinct individual.

Protocol (prō'tu-kul), in diplomacy, a document serving as a preliminary to, or for the opening of, any diplomatic transaction; also, a diplomatic document or minute of proceedings, signed by friendly powers in order to secure certain political ends peacefully. A notable instance was the protocol bringing an end to hostilities in the war between the United States and Spain, and preceding the regular treaty of peace.

Protogene (prō'tu-jēn), a species of granite composed of felspar, quartz, mica, and talc or chlorite: so-called because it was supposed to have been the first-formed granite. It occurs abundantly in the Alps of Savoy, and is found in Cornwall, where, on decomposition, it yields china-clay or porcelain-earth. It is also called *Talcose-granite.*

Protogenes (prō-toj'e-nēz), a Greek painter, contemporary with Apelles, born at Caunus in Caria, flourished between 332 and 300 B.C. Protogenes is said to have lived in comparative obscurity at Rhodes till the fiftieth year of his age, when his merits were made known to his fellow-citizens through a visit of Apelles.

Protophytes (prō'to-fīts), a name given to the lowest organisms in the vegetable kingdom, consisting either of a single cell or of several cells united by a gelatinous substance but without any essential mutual dependence, and corresponding to the Protozoa of the animal kingdom.

Protoplasm (prō'to-plazm), a substance consisting of carbon, oxygen, nitrogen, and hydrogen, nearly identical with the white of an egg, and constituting the most elementary living matter in animal and plant structures. It is colorless, transparent, and apparently destitute of structure, and is seen in its simplest form in some of the lowest types of animal life, as in the Protozoa. When unrestricted by an imprisoning envelope it is endued (as is seen in *Amœba diffluens*) with the power of extending itself in all directions in the form of mutable processes which can be withdrawn spontaneously, and it has also the power of passing or flowing in minute masses through closed membranes without these masses thereby losing their identity of form. In the form of cells, the skin

of which is merely dead and hardened protoplasm, and enclosing a nucleus, or with a nucleus embedded in its substance, it is the structural unit of all organized bodies, constituting not only the basis of the ovum of both plants and animals, but of the tissues themselves in their perfect state, which are mere multiples of such cell-units variously modified. As the protoplasm in our bodies is continually undergoing waste, a continuous renewal of the material is essential to the continuance of life. Animals, however, cannot elaborate protoplasm from mineral substances for themselves, they being able only to convert by the process of digestion dead protoplasm into living. Plants can, on the other hand, manufacture protoplasm from mineral compounds and the atmosphere, and so they are the storehouse of protoplasmic matter for the animal kingdom. Some biologists prefer the term *Bioplasm* to that of *Protoplasm*, as being more expressive of its function. *Sarcode* is also used similarly.

Protornis (prō-tor'nis), the name given to the earliest fossil passerine bird yet known. In size and structure it approaches the lark, and it occurs in the Eocene strata of Glarus.

Protosaurus (prō-tu-sạ'rus), the name given to a fossil monitor lizard, which occurs in the Durham Permian rocks. It was long the earliest known fossil reptile.

Protozoa (prō-tu-zō'a), a subkingdom including the most lowly organized members of the animal kingdom. The Protozoa may be defined to be animals composed of a nearly structureless jelly-like substance termed *sarcode* or *protoplasm*, not possessing permanent distinction or separation of parts, and without a definite body cavity or trace of a nervous system. The animals present the appearance of a transparent, gelatinous cell containing a nucleus. In many, contractile vesicles have been observed which perform the office of a heart. The organs of locomotion are varied. In some of the higher forms movements are effected by means of cilia, in others by long, whip-like bristles termed *flagella*. but the most characteristic organs of locomotion are processes named *pscudopodia*, consisting simply of prolongations of the sarcodic substance of the body, which can be emitted and retracted at pleasure. The Protozoa are single-celled animals and, with the exception of a few inhabiting the bodies of animals, are aquatic in their habits. They are of very minute size. They have not the usual reproductive organs, this function being fulfilled by means of simple cleavage or 'fission,' and, except in the higher forms, they have no differentiated mouth, the food being simply absorbed. From this fact the Protozoa have been divided into those that have a distinct external mouth and those that have no distinct mouth; but this classification has no great value. A better mode of division is into the three classes of *Gregarinidæ*, *Rhizopoda* and *Infusoria*. See these terms.

Proudhon (prö-dōṇ), Pierre Joseph, a French publicist, born at Besançon, in 1809; died there in 1865. He was the son of poor parents, who were unable to pay for his education, but he was enabled to attend gratuitously the college of his native town. At the age of nineteen he entered a printer's office, afterwards became a press reader, and in this way acquired considerable linguistic knowledge, with the result that he wrote an *Essai de Grammaire Générale*. As a reward for his studious labors he had conferred on him by the Academy of Besançon the *pension Suard*, which yielded him an income of 1500 francs for three years. Political economy now became his chief study, and in 1840 appeared his famous work, bearing on the title-page the question: *Qu'est-ce que la Propriété?* ('What is property?'), to which the first page of the treatise contains the answer, *C'est le Vol* ('it is theft'). For this treatise, and two others which followed, he was prosecuted at Besançon, but was ultimately acquitted. In 1843 he managed a system of water transport on the Rhône and Saône; settled in Paris in 1847; started various newspapers, and became a leader in the revolution of 1848; was elected a representative for the Seine in the Constituent Assembly; attempted with no success to found a Banque du Peuple; and for his outspokenness in the press he was imprisoned for three years. Besides those already noticed his more important treatises are: *Discours sur la Célébration du Dimanche*, *De la Création de l'Ordre dans l'Humanité*, and *Système des Contradictions Economiques*.

Prout, Father. See *Mahony, Francis*.

Prout, Samuel, painter in water-colors, born in Plymouth in 1783; died in 1852. He received a few lessons in drawing in his native town, and prosecuted his work by industriously sketching from nature. In 1803 he visited, and in 1812 finally removed to London, where he maintained himself by receiving pupils and furnishing drawings for Britton's topographic and architectural publications. He was an occasional exhibitor at the Academy and British Institution

from 1803 to 1827, and was one of the earliest members of the Society of Painters in Water-colors. In 1818 he visited the continent, after which he made repeated artistic tours; he became famous for his drawings of street scenes and the quaint mediæval architecture of Europe. Some of his sea-coast scenes exhibit great power. His drawings are held in much repute.

Provençal (prō-vaṇ-sal') LANGUAGE AND LITERATURE, strictly the language and literature of that portion of Southern France known as Provence, but in its widest application the Provençal language includes the Romance form of speech belonging to the inhabitants of a geographical area which comprises the whole south of France (especially Provence, Limousin, Auvergne), with Catalonia and Valencia in Spain. This language was the earliest cultivated of the Romance languages (or those based on the Latin), and at one time was extensively used in literature. It was also called *langue d'oc* in contradistinction to the kindred speech of Northern France, the *langue d'oui;* and yet again it received the name of *lengua lemosina* probably from the wide fame of a few Limousin troubadours. Provençal, as a new and distinct language, appears in historical records about the tenth century, and continued as a medium of living literary expression until about the end of the thirteenth century. In 1350 a few scholars of Toulouse attempted to revive its decaying glory, and for this purpose composed a treatise on grammar and poetry called the *Leys d'Amors.* About the middle of the fifteenth century the language ceased to be used both for administrative and literary purposes, and it has long been reduced almost to the condition of a *patois.* In the last century such poets as Jasmin and Mistral have endeavored to resuscitate Provençal as a literary language, and have produced poems of no small value written in the modern form of it; while a society of literary men and scholars (*lou Felibrige*) exists for the purpose of furthering this object. Still Provençal is a language whose interest as a vehicle of literature is mainly in the past. This interest begins in the early part of the eleventh century with a didactic poem, based by its unknown author on the *De Consolatione Philosophiæ* of Bœtius; but Provençal literature in its development found most characteristic expression in the amorous lyrics of the troubadours. The earliest of these lyric poets was William IX, count of Poitiers, about the close of the eleventh century, who was followed in France, Italy, and Spain by an innumerable band of poets in the Provençal tongue. Most of this poetry was intended to be sung, and not infrequently the poet also composed his own music. Besides the lyric poetry, of which there were various classes, Provençal poetry also existed of a narrative character, in which legendary and historical themes were treated in epical detail. The rapid decay of this Provençal literature, which was almost exclusively the possession of the upper classes, was largely due to political causes. During the war with the Albigenses the social condition of the feudal nobility in the south of France suffered such downfall that thenceforth the art of the troubadour and the minstrel ceased to be lucratively attractive. See *Troubadour.*

Provence (pro-vaṇs), one of the old provinces of France, lying in the southeastern part of the country, on the Mediterranean, bounded on the north by Dauphiné and Venaissin, on the east by Piedmont, and on the west by Languedoc. It now forms the departments of Bouches-du-Rhône, Var, and Basses-Alpes, with parts of Vaucluse and Alpes Maritimes. The capital was Aix, and the province was divided into Upper and Lower Provence. Greek colonies were founded here at an early period; and the Romans having conquered all the southeast of Gaul (B.C. 124-123) gave it the name of *Provincia Gallia,* or simply *Provincia* (the province), whence its later name was derived. It passed successively into the hands of the Visigoths, Ostrogoths, Franks, and in 879 became part of the kingdom of Burgundy. It subsequently was ruled by the counts of Arles, and the counts of Barcelona, then by Charles of Anjou (brother of Louis IX of France) and his descendants, and passed to Louis XI of France in 1481.

Proverb (prov'erb), a short, pithy sentence forming a popular saying and expressing some result of the experience of life in a keen, quaint, or lively fashion. Proverbs have been defined by Cervantes as 'short sentences drawn from long experiences'; by Howell as sayings which combine 'sense, shortness, and salt'; by Bacon as 'the genius, wit, and spirit of a nation'; and by Earl Russell as 'the wisdom of many, and the wit of one.' They have formed an important part of the common wisdom of both eastern and western civilizations, and in this way they are interesting in a study of the spread and structure of language, as it has been pointedly applied to changing manners and customs. Greek and Latin proverbs

were collected by Erasmus in his *Adagia;* English proverbs have been collected by Camden, Howell, Ray, Kelly, Bohn (an enlarged and improved edition of Ray), and Hazlitt; Scotch by Allan Ramsay and by A. Hislop; French by De Lincy; German by various collectors, more especially Wander; Arabic by Burckhardt and by Freytag; Bengali by Long.

Proverbs, one of the canonical books of the Old Testament, usually in the main ascribed to Solomon, in accordance with the superscriptions in chap. i, 1; x, 1; xxv, 1, which, if not written by Solomon himself (as the first two of them may have been), at least represent the traditional views of the ancient Jewish Church. According to modern Biblical critics, the book of *Proverbs* is composed of several sections written by different authors and at different times, and finally collected into a single book at some period subsequent to the return from the captivity. All seem to be agreed that some part of the book is to be ascribed to Solomon, but there is great diversity of opinion as to how large his share is. With regard to the other two contributors to *Proverbs* named in the book itself, Agur and Lemuel, nothing whatever is known; and in the case of Lemuel it is even suspected that the name is not that of a real personage. The canonicity of the book of *Proverbs* is represented as a subject of dispute in the *Talmud*, some having objected to receive the book as canonical on account of the contradictions it contains. It ultimately found its place, however, in all the Jewish lists of the sacred writings.

Providence (prov'i-dens), a city and capital of the state of Rhode Island and county seat of Providence county, situated on both sides of the Providence River, at the influx of the Seekonk, Moshassuck and Woonasquatucket rivers. It is 45 miles S. S. W. of Boston on the New York, New Haven and Hartford R. R. The west side of the city is a low plain; the east side a plateau and low hills. Most of the manufacturing establishments are on the banks of the Moshassuck and Woonasquatucket. There are many fine public and private buildings. Of the former the most important are the State house (1900), city hall, library building, court house, Rhode Island and Butler Hospitals, the buildings of Brown University, etc. With Brown University (founded in 1764), there is a library of about 200,000 volumes. At the south end of the city is Roger Williams Park, containing a statue of Roger Williams, the founder of the city. Providence is notable for its manufacturing industries, it being one of the great centers of manufacture of the country. Prominent among its productions are silverware, screws, tools, locomotives, etc., with many others, including flour and saw mills, cotton and woolen factories, foundries, steam-engine and boiler factories, machine-shops, printing, bleaching, calendering, and dye works, etc. Providence has a safe and commodious harbor, though somewhat difficult of access, and the coasting trade is important. It was at one time an important seat of foreign commerce, but this has declined. Providence was first settled in the year 1636, incorporated in 16[illegible] has rapidly increased in size since 1820. Pop. (1910) 224,326; (1920) 237,595.

Province (prov'ins), originally a country of considerable extent, which being reduced under Roman dominion was new modeled, subjected to the command of a governor sent from Rome, and to such taxes and contributions as the Romans saw fit to impose. In modern times the term has been applied to colonies or to independent countries at a distance from the metropolis, or to the different divisions of the kingdom itself. Thus the Low Countries belonging to Austria and Spain were styled *provinces.* The different governments into which France was divided previous to the revolution were also called provinces. The name has sometimes been retained by independent states. Thus the Republic of Holland, after it had thrown off the Spanish yoke, was called the United Provinces; and the Argentine Republic used to be called the United Provinces of the Plata. In the canon law the term is applied to the jurisdiction of an archbishop. In the Roman Catholic Church it is also given to the territorial divisions of an ecclesiastical order such as the Franciscans.

Provins (pro-vaṇ), a town in France, department of Seine-et-Marne, 30 miles east of Melun, and 60 miles S. E. of Paris. It has remains of old walls, a tower called Cæsar's Tower, a church of the twelfth century, etc. Provins is mentioned in a capitulary of Charlemagne in 802, and in the thirteenth century it was a large and important city. It derives its modern reputation from its mineral waters. Pop. 8726.

Provo (prō'vō), a city of Utah, the seat of Utah Co., on Provo River, 3 miles E. of Utah Lake, and 48 miles S. S. E. of Salt Lake City. It contains a state insane asylum, has flour, woolen, and knitting mills, and is sur-

rounded by a fertile farming and fruit country. Pop. 10,303.

Provost (prov'ust, prō'vō), a title given to the president of certain bodies, as the heads of several of the colleges in the Universities of Oxford and Cambridge, equivalent to *principal* in other colleges. In the Scotch burghs the provost is the chief magistrate, corresponding to the English mayor. The chief magistrates of Edinburgh and Glasgow are styled *lord provost*. In the United States there is a limited use of the term *provost*, applied to the chief officer of an educational institution.

Provost-marshal, in the army, is an officer of the rank of a captain, who deals with offenses against discipline, brings the offenders to punishment, and sees the sentence executed. In the navy there is a similar office.

Prudentius (pru-den'she-us), AURELIUS CLEMENS, one of the early Christian poets, born at Calagurris in Spain in 348 A.D.; died after the beginning of the fifth century. In his latter years he composed a great number of hymns and other poems of a religious nature in which he successfully imitated classical models.

Prudhon (prü-dōn), PIERRE, a French painter, born in 1758; died in 1823. He studied his art at Dijon and in Rome, where he came under the influence of Correggio and of Leonardo. He afterwards settled in Paris, where he gradually made his way, and at length became famous by his *Truth Descending from Heaven, Psyche Carried off by Zephyr, Crime Pursued by Justice and Divine Vengeance*, etc. His importance consists in the fact that, in opposition to David, he accentuated the purely pictorial element and the effect of light in his works.

Prunella, Prunello (prö-nel'a, o), a kind of woolen stuff of which clergymen's gowns were once made, and which is still used for the uppers of ladies' boots and shoes. Prunella is also the name of a genus of plants, order *Labiaceæ*, with one American species, known as Blue-curl or Self-heal, at one time in repute as a febrifuge. It is mildly aromatic and slightly astringent. Prunello (diminutive of prune) is the name given a kind of plum.

Prunes. See *Plum*.

Pruning (prön'ing), is the severing of portions of the stem, branches, shoots, leaves, or roots of a plant for the purpose of removing excrescent or unprofitable growths, and rendering the sap more conducive to the nutrition of the valuable parts of the plant. The immediate effect of pruning is to reduce the growth of a plant in as far as it depends on the amount of foliage duly exposed to the light; but as by judicious pruning the parts left have not only a greater share of sap, but are better exposed to the light, its ultimate effect is to produce a larger and stronger plant. From the tendency of sap to flow in increased quantity into the parts immediately adjoining those where its flow has been interrupted, an almost unlimited power is given to the gardener of controlling the direction of the growth of a plant. The season for pruning varies with the nature of the tree and the purpose for which it is pruned. In general it may be said that autumn and winter are the best seasons for extensive pruning; in summer an excess of vigor in the plant may require a little pruning, but in spring it not only weakens the plant, but is liable to induce disease. *Root-pruning* is employed to check rapidity of growth and to induce development of flower-buds. The best season for this operation is after the leaves have fallen in autumn or before the sap begins to flow in spring.

Prunus (prö'nus), a genus of arborescent plants belonging to the nat. order Rosaceæ, and comprehending the cherry, bird-cherry, plum, damson, sloe, bullace, apricot, etc.

Prurigo (prö-rī'gō), a papular eruption of the skin in which the papules are diffuse, nearly of the color of the cuticle, intolerably itchy, the itching being increased by sudden exposure to heat, and when abraded oozing out a fluid that concretes into minute black scabs.

Prussia (prush'a; German, PREUSSEN), the leading state of the German Empire, comprising the northern part of Germany. The following table is from the 1901 census. By the peace of 1919 (see *Treaty*), Prussia lost W. Prussia and Posen.

Provinces.	Area — sq. miles.	Population.
East Prussia	14,275	1,996,626
West Prussia	9,846	1,563,658
Brandenburg	15,400	3,108,554
Pomerania	11,623	1,634,832
Posen	11,178	1,887,275
Silesia	15,557	4,668,857
Saxony	9,746	2,832,616
Schleswig-Holstein	9,273	1,387,968
Hanover	14,853	2,590,939
Westphalia	7,798	3,187,777
Hesse-Nassau	6,055	1,897,981

Rhineland	10,418	5,759,798
Hohenzollern	441	66,780
Berlin (city)	25	1,888,848
	136,488	34,472,509

The census of 1910 indicated that the population of Prussia had increased to 40,157,573. The revised boundary of 1919 (see map of Germany) reduced the area by about 25,000 square miles and the population by about 4,000,000. The capital is Berlin. Other important cities are Breslau, Charlottenburg, Cologne, Düsseldorf, Frankfort, Hanover, Kiel, Magdeburg, Königsberg, and Stettin.

Physical Features.— The whole of northern and eastern Prussia, from Holland on the west to Russia on the east, belongs to the great plain of Northern Europe, and may be described generally as a vast plain, elevated in the south and southwest, and thence descending towards the Baltic and the German Ocean. The loftiest summits are on the southern frontiers, where the Riesengebirge and the Sudetic Mountains form the boundary between Prussia and the Austrian dominions. The highest Prussian mountain is the Schneekoppe in the Riesengebirge (5257 feet). Further to the west the Thuringian forest and the Harz Mountains cover a considerable area, the latter rising in the Brocken to the height of 3742 feet. On the shores of the Baltic and North Sea, large tracts are only saved from inundation by low sand hills. Behind these hills extensive lagoons, on the Baltic coast called Haffs, have been formed, communicating with the sea by narrow outlets. The chief bays or gulfs are Danzig Bay, Pomeranian Bay, and Kiel Bay, all on the Baltic coast; and on the Baltic coast are the islands of Rügen, Usedom, Wollin, etc.; in the North Sea the North Frisian Islands and East Frisian Islands. The principal river which drains this portion of Prussia is the Elbe, which enters it from the Kingdom of Saxony, flows northwestward, and enters the North Sea between Hanover and Holstein. The Weser, with its tributary the Aller, and the Ems, are the principal rivers west of the Elbe. The Oder lies almost wholly within Prussian territory, and enters the Baltic by the Pommerische Haff. The Vistula or Weichsel flows in a northern direction through Eastern Prussia, and throws off two large branches which enter the Frische Haff, while the main stream passes into the Gulf of Danzig. The other more important rivers are the Passarge, the Pregel, and the Niemen or Memel. Lakes abound in almost every province, but more especially in those of East and West Prussia, Pomerania, and Brandenburg. The chief coast lagoons are the Pommerische Haff, Frische Haff, and Kurische Haff. The climatic conditions of this extensive territory must necessarily be diversified. The average of a number of places situated between the highest and lowest latitudes gives a mean annual temperature of 52° Fahr.

The southwestern division of Prussia, consisting of the greater part of Westphalia, the Rhenish province, and Hesse-Nassau, differs so much from the eastern division as, in many respects, to present a striking contrast to it. In particular, its surface as a whole is much more finely diversified. Its mountains stretch across the country in all directions, and from numerous valleys, one of which, that of the Rhine, in point of fertility and beauty is not surpassed by any other valley in Europe. Though the surface is thus diversified, the mountains nowhere reach any great elevation, the highest summit being the Wasserkuppe, on the borders of Bavaria, 3316 feet. By far the greater part of this portion of the Prussian monarchy belongs to the basin of the Rhine, which, entering it on the southeast, traverses it in a N. N. W. direction till it enters Holland. There are numerous streams tributary to the Rhine, the largest being the Moselle, with its tributary the Saar. There are no lakes worth mention in this portion of Prussia. As compared with the division already described, the climate of this part of Prussia is milder in winter and cooler in summer, the mean annual temperature being about 1° higher.

Agriculture, etc.— The land in Prussia is much subdivided, especially in the more populous districts, small farms of 3 or 4 acres being the most common holding. In East and West Prussia the soil is for the most part poor; the Rhine valley and the province of Saxony may be considered the most productive portions of the kingdom. Rye is the chief agricultural product, oats are largely grown in the northeast, wheat chiefly in the south and west, while the other grain crops are spelt (an inferior sort of wheat), maize, millet, and barley. Potatoes are extensively cultivated; beet-root for the production of sugar is a very important crop; flax, hemp, and rape-seed cover large areas; tobacco is raised in several provinces; and in the Rhine and Moselle districts the vine is freely cultivated and some of the finest wines produced. In East Prussia horses are reared chiefly for military purposes; cattle are largely

exported from the maritime provinces, and in West Prussia and Pomerania sheep are raised in large numbers. Along the Baltic and the North Sea a considerable number of the inhabitants are employed in the fishing industry. The forests cover about 20,000,000 acres, nearly one-fourth of the total area, and are a great source of wealth, forestry being nowhere better understood than in Prussia. The best wooded provinces are Brandenburg, Silesia, and Rhenish Prussia. In some of the forests the wild boar is common, other wild animals being the wolf, lynx, wild-cat, etc.

Mining and Manufactures.— Mining is one of the chief branches of Prussian industry; the most important mineral products being coal and lignite, iron, copper, lead, silver, and zinc, while other minerals produced to a greater or less extent are cobalt, nickel, arsenic, antimony, manganese, rocksalt, kainit and other potash salts, alum, and copperas. About a third as much coal is raised in Prussia as in Britain, the chief coal-fields being in the Rhine province, Westphalia, and Silesia. Iron is found in all parts, the principal areas being Westphalia, Silesia, the Rhine province, and the Harz; copper is found chiefly in the Harz and Westphalia; silver chiefly in Hanover; lead is found in Silesia, the Rhenish province, Westphalia, and Saxony; zinc in the same localities, except Saxony; cobalt in Westphalia and Saxony; arsenic in Silesia. Amber is found along the shores of the Baltic. The chief textile manufactures are those of linens, cottons, and woolens. Silesia, Brandenburg, and Westphalia are the provinces in which the linen industry is chiefly developed; the cotton manufacture is most extensive on the Rhine; the woolen manufacture has its chief seats in Brandenburg and the Rhenish province; while silk and velvet are made in the Rhine valley, as also at Berlin. In iron and steel ware the chief manufacturing centers are Essen, Solingen, Aix-la-Chapelle, and Burtscheid. At Essen are located the great Krupp ordnance and armor-plate works, nowhere surpassed in output. The manufacture of porcelain and the finer kinds of ware is extensive, and leather and paper making are large industries. Other manufactures of national importance are beet-root sugar, chocolate, chicory, chemical products, and tobacco.

Trade and Commerce.— Prussia carries on a large trade both by sea and with its inland neighbors. The principal exports are textile fabrics, yarn, metals and metal wares, agricultural produce and live stock, wool, chemicals, spirits, coal, timber, leather, stoneware and glass, etc.; and the imports are chiefly in the raw materials connected with the textile and other manufactures, and tea, coffee, sugar, and other colonial products. Besides the ordinary road and canal communication, Prussia has an extensive system of railways, nearly all national property. The principal ports are Stettin, Pillau, Königsberg, Stralsund, Kiel, and Flensburg on the Baltic; and Altona on the North Sea. In many of these ports, and particularly in Stettin, shipbuilding is carried on with considerable activity. The system of money, weights and measures in Prussia is the same as that of the rest of Germany. See *Germany.*

Government, Administration, etc.— Prussia was proclaimed a republic on November 13, 1918, two days after the armistice that terminated the European war (q. v.). Prior to that date it was a monarchy, hereditary in the male line, the constitution being framed by the government with the aid of the constituent assembly, in 1850, and subsequently modified by royal decrees. The King of Prussia, who also bore the title of German Emperor, was assisted in the executive by an irresponsible privy-council and by a cabinet which was nominally responsible to a legislative assembly composed of two chambers. The upper chamber (*Herrenhaus*) was composed of princes of the blood of the reigning and former sovereign families of full age; the heads of the mediatized principalities; the territorial nobility created by the king; life peers chosen by the king; titled nobility elected by resident land-owners; representatives of the universities, cities, etc.; and a number of others appointed by the king for any term he pleased. At the fall of the monarchy in 1918 the large land-owning class made up about two-thirds of the membership of this upper house. The second chamber, or House of Deputies (*Abgeordnetenhaus*) was composed of 443 members, elected by indirect vote for a term of five years. The primary qualification of electors was based on taxation.

The constitution of the Free State of Prussia, adopted in April, 1920, gives a vote to every citizen over 20 years of age. The Assembly, or Parliament, is elected for four years and the ministry is invested with the powers of the former king, William II. The first Prussian Constitutional National Assembly elected by universal, equal, and secret suffrage of men and women met on March 14, 1919. Out of a total membership of 401, there were 142 Majority Socialists, 87 Center (Cath-

clics), 61 Democrats, 41 Conservatives, 24 Independent Socialists, and 18 German People's Party. The premier, appointed in 1920, was Herr Braun (Socialist).

Prussia is by far the most important state in the German Republic. Absolute religious liberty is guaranteed, although over two-thirds of the population are Protestants. A very complete system of primary, secondary, and university education exists, all grades of schools being linked together according to a definite scheme or schemes of study. Elementary education is enforced by law, maintained by local taxes, and administered by local authority. Prussia has ten universities — Berlin, Bonn, Breslau, Göttingen, Greifswald, Halle, Kiel, Königsberg, Marburg and Münster, attended by some 15,000 students in all. All private as well as public educational establishments are placed under the superintendence of the minister of public instruction, and all public teachers are regarded as servants of the state. The Prussian army and navy form an integral part of those of Germany in general. See *Germany*.

History.— The historical development of the Prussian Kingdom is closely associated with three important elements. The first of these is found in the growing power of the Electorate of Brandenburg, which formed the nucleus of the future kingdom; the second relates to the acquirement of the province of Prussia, which gave its name to the new heterogeneous territory; and the third is associated with the rule of the Hohenzollern family, under whose skilful diplomatic and military guidance the small Brandenburg electorate has grown into what is now considerably the larger portion of the German Empire. Brandenburg, which had been conquered by Charlemagne in 789, was erected into a margraviate by Henry I (the Fowler), emperor of Germany in 926. Albert the Bear, who received Brandenburg as a fief from the Emperor Lothaire (1134), conquered the Slavonian Wends, and took in 1157 the title of Margrave of Brandenburg. His dynasty continued to bear rule till 1320, and during this period German civilization was gradually extended in Pomerania, Saxony, Brandenburg, and Silesia. After its extinction there followed a period of anarchy, during which Brandenburg fell as a lapsed fief to the empire, and Louis of Bavaria gave it to his son. Remaining under Bavarian rule for three electorates it was subsequently ceded to the house of Luxemburg, and Charles IV, the first imperial representative of this house, gave it successively to his sons Wenceslaus (1373) and Sigismund (1378). The latter being in debt received from Frederick, the burgrave of Nürnberg, a loan of 400,000 gold florins, for which Frederick held Brandenburg in pawn, and subsequently acquired it in full. This burgrave was the descendant of Conrad of Hohenzollern, a cadet of a Suabian family to whom belonged a small territory surrounding the ancestral castle of Hohenzollern, of which they traced their lordship back to the time of Charlemagne. Brandenburg, which Frederick had thus acquired, was covered with feudal strongholds, which he gradually reduced, and he also added the two small territories of Ansbach and Baireuth. Frederick II, who succeeded his father in 1440, extended the possessions of his family by policy as well as by valor. In 1470 he abdicated in favor of his brother Albert III, surnamed Achilles, who, by a family ordinance, prepared the way in an important respect for the future greatness of his house by providing for the undivided descent of the dominions in connection with the electorate. His grandson, Joachim II, who succeeded in 1535, embraced the Reformation, and established Lutheranism in 1539. In 1537 he acquired the reversion of the principalities of Liegnitz, Brieg, and Wohlau. John George succeeded in 1571. Joachim Frederick, who succeeded in 1598, married his son John Sigismund to the daughter of Frederick Albert, duke of Prussia; and in 1618 John Sigismund united the duchy of Prussia to the electorate, thus bringing it about that the whole country became known as Prussia.

The Prussians were a Slavonic people inhabiting the coast territory situated between the Vistula and the Niemen. Their neighbors, the Poles, endeavored to convert them to Christianity, and to this end they (1283) conquered the whole country with the aid of the Teutonic Knights of St. George. As the price of this assistance the knights claimed the conquered territory, and established themselves in castles and walled cities. Their rule, which was a despotic oligarchy, was finally overturned by the combined forces of the Prussians and the Poles, and in 1466 West Prussia was ceded to Poland and East Prussia made a fief of the Polish crown under a grandmaster, and later under a duke. It was as successor to Duke Frederick Albert, his father-in-law, that John Sigismund obtained the duchy of Prussia. By the treaty of Xanten (1614) Clèves, La Marck, etc., were assigned to Brandenburg, and in this manner was laid the

foundation of the Prussian Rhine province.

John Sigismund was succeeded in 1619 by his son George William, who was a weak and vacillating ruler, unequal to encounter the terrible crisis that now occurred in the affairs of Germany, the Thirty Years' war. During this war the electorate became the battleground of the contending forces, and suffered severely, being at the death of the elector in 1640 occupied by Swedish troops. A very different man was his son Frederick William (which see), called the Great Elector, who may be regarded as the virtual founder of the Prussian monarchy. He found his country weak, and left it strong and with its boundaries extended, and provided with a well-equipped army and a well-filled treasury. Dying in 1688, he was succeeded by his son Frederick, who in 1701 had himself crowned as king, being the first King of Prussia. Under his rule the Prussian troops fought side by side with the English at Blenheim, Ramillies, Oudenarde, and Malplaquet. Frederick I was succeeded by his son (1713) Frederick William I, who governed Prussia till 1740. His reign was on the whole peaceful, and the country grew greatly in population, industry, and wealth. He went to war with Charles XII, and acquired part of Pomerania, with Stettin, from Sweden. At his death he left a prosperous country, a well-supplied treasury, and an army of 80,000 men to his successor.

Frederick II, surnamed the Great (which see), succeeded to the crown on the death of his father in 1740. In less than a year after his accession he proclaimed war against Maria Theresa in order to enforce his claim to the Silesian principalities, and invaded Silesia. At the persuasion of England Maria Theresa entered into negotiations with him, but failed at first to come to an understanding. Ultimately, however, by a treaty concluded at Berlin (1742) Frederick obtained the cession, with the exception of some specified districts, of both Upper and Lower Silesia, and of Glatz. Conceiving that the Austrians might seek to regain this territory, Frederick in 1744 invaded Bohemia, and commenced what is called the Second Silesian war. He was at first compelled to retreat, but subsequently gained such successes that, when peace was concluded in 1745, Austria confirmed the cession of Silesia, which was guaranteed by Great Britain. Prussia now enjoyed an interval of prosperous peace, which the king was desirous to maintain. But his continued success had aroused the fear of Austria and the enmity of France and Russia, so that these powers projected a scheme of conquest which embraced the partition of Prussia. Before their plans could be matured Frederick invaded Saxony, entered Dresden, and published the despatches which proved the existence of the scheme. England now openly entered into a defensive alliance with Frederick, and subsidized him. The allies, whose plans had been discovered (Austria, France, Russia, and Sweden), prepared for immediate hostilities. In the Seven Years' war (which see) following upon this movement, the immense forces which his enemies were able to bring into the field reduced Frederick to the greatest straits, and gave opportunity for the development of his strategic genius. Towards the close of the war the English cabinet began to draw off from the Prussian alliance, but the death of the Empress Elizabeth (1762) broke up the alliance against Prussia, and the Peace of Hubertsburg (1763) put an end to the war. According to Frederick's calculation, 886,000 men had perished in a war which failed in effecting any territorial change; but it transformed Prussia into one of the chief European powers. Frederick determining again to extend his boundaries, entered into an alliance with Austria, and invaded the territories of Poland. Negotiations followed with Russia, and in 1772 the partition of the weak kingdom of Poland was arranged in a treaty between the three powers. In this way Prussia obtained most of Pomerania and a large portion of Poland. (See *Poland.*) Frederick died in 1786, and was succeeded by his nephew Frederick William II.

The new king had neither the military skill nor the strength of character possessed by his predecessor. He continued the absolutism, but curtailed some of the freedom of the former reign. In 1788 he made a useless armed intervention in the affairs of Holland, and in 1791 interfered in the affairs of France on behalf of Louis XVI. In 1792, war having already been declared by the French authorities against the empire, the Prussians, under the Duke of Brunswick, invaded France. They were defeated by Kellerman at Valmy, and soon afterwards Frederick William withdrew from this war with France, in which he had been the most active promoter. Then followed a second and a third partition of Poland (1793, 1795), by which Prussia acquired a considerable accession of territory. By the treaty of

Basel, concluded in 1795 with the French Republic, Prussia openly abandoned her connection with the other European powers, and in a secret treaty of the following year France was permitted to advance her frontier to the Rhine, while a new line of neutrality was formed by which Saxony and other South German states withdrew their support from the empire. Frederick William died in 1797, and was succeeded by Frederick William III. Continuing his father's policy in regard to France, he courted the French directorate, and at the Peace of Lunéville (1801) Prussia was indemnified by 4116 square miles ceded at the expense of the empire. In 1804 Prussia recognized Napoleon as Emperor of France, and in the campaign which ended in the overthrow of Austria at Austerlitz (1805) remained neutral. This attitude was at first successful, but ultimately it led to distrust among the German states, and by the formation of the Confederation of the Rhine Prussia was isolated and left to the mercy of Napoleon. At the instigation of the latter Prussia had occupied Hanover, but Napoleon treated this fact with contemptuous indifference when he offered to restore Hanover to England. In his indignation at this insult Frederick William declared war against France without an ally. Although the Prussian army numbered 180,000 men, the French emperor was able to put a larger force in the field. On October 14, 1806, the armies met at Jena and Auerstädt, where the Prussians were completely defeated, and the whole country was soon in the hands of Napoleon, who entered Berlin in triumph. At the Peace of Tilsit (June, 1807), concluded between Prussia and Napoleon, all lands between the Rhine and the Elbe were ceded to Napoleon for his free disposal, a war indemnity of 140,000,000 francs was imposed on the mutilated kingdom, and Frederick William was also put under treaty obligation not to maintain an army of more than 42,000 regular troops during the next ten years. The years which followed this national disaster were chiefly remarkable for the sweeping internal reforms which the crisis necessitated, carried out under Baron Stein and Baron Hardenberg, and almost amounting to a revolution. The restriction of the army to 42,000 was evaded by replacing rapidly the drilled men by another body of undrilled men. Thus, after Napoleon's disastrous Russian campaign of 1812, Prussia was prepared to take prompt advantage of her opportunity. The king issued a general call to arms, and 150,000 men at once responded. A treaty with Russia was concluded at Kalisch, and the league thus formed was joined afterwards by Austria. In the great struggle for the overthrow of Napoleon which followed (see *France*), an important part was taken by the Kingdom of Prussia, and the Prussian troops were similarly important in the Waterloo struggle. At the Congress of Vienna (1815), when the map of Europe was rearranged, Prussia, though losing some possessions, was indemnified with others more extensive and valuable, and was placed in a more advantageous position than before. She now also formed one of the states in the new German Confederacy.

After the restoration, Frederick William III leaned to the despotic counsels of Austria and Russia, supported heartily the Holy Alliance, and entered upon a reactionary policy which continued until his death in 1840. He was succeeded by Frederick William IV, who was expected to grant a constitution to his subjects, but refused the demand of his states to this effect in 1841. In 1847 he tried to anticipate the revolutionary movement spreading throughout Europe by summoning a combined meeting of provincial parliaments at Berlin, but he conferred on them no real power. In the following year, however, after a deadly struggle, in which Berlin was declared in a state of siege, the king dismissed his ministers, and granted a constitution, the details of which were elaborated by a new parliament, and which was formally proclaimed in 1850. The Poles in 1848 revolted against Prussian rule, but the movement was summarily suppressed. In 1848 a deputation of the German national assembly at Frankfort offered the crown of Emperor of the Germans to the King of Prussia, but it was declined. By this time two parties existed in the Germanic Confederacy, one of them desiring Prussia to be the chief state in Germany, to the exclusion of Austria altogether; henceforth there was a strong rivalry between these two states. In 1857, the king being unable to conduct affairs by reason of mental illness, his brother William became regent, and ultimately succeeded to the throne on the death of Frederick William in 1861.

The new king, William I, showed a disposition to absolutism, which in 1862-63 occasioned a lengthened dispute between the chambers and the ministry under Count Bismarck. At this time, on the complaint of the Federal Diet that Denmark had not observed its treaty

obligations in regard to the duchies of Schleswig and Holstein, the Prussians, under General Wrangel, entered Schleswig (1864), and Denmark was overpowered. By the Treaty of Vienna, signed October 30, 1864, Denmark gave up Schleswig, Holstein, part of Jutland, and Lauenburg to Germany. In the following year Prussia purchased the claims of Austria over the Duchy of Lauenburg, and it was agreed that Schleswig and Holstein should be administered separately by both powers. But this settlement did not last long. Prussia, which had determined on appropriating them, wished to buy out Austria, but the latter would not cede her claims for money. This led to war between the two powers and to the break-up of the German Confederation, some of the states of which sided with Prussia, others with Austria. On June 15, 1866, the Prussian troops took the offensive, and the brief campaign which ensued is known as the Seven Weeks' war. The Prussian forces were armed with the new needle-gun, and the whole movements were directed by the chief of staff, Count von Moltke. The Austrians, under General Benedek, were completely defeated near Königgrätz in Bohemia, where on July 3d was fought the decisive battle of Sadowa; and peace soon followed. A subordinate campaign against Hanover, Bavaria, and other states had been conducted by the Prussians with complete success. After the war Prussia incorporated Hanover, Hesse-Cassel, Nassau, Hesse-Homburg, Schleswig, Holstein, Lauenburg, Hesse-Darmstadt north of the Main, and the principality of Hohenzollern, which already belonged to the royal family. The King of Prussia now invited the States of North Germany to form a new confederation, which was established on the basis of proposals made by Prussia. The jealousy of France was excited by this powerful confederation, and in 1867 the question of the disposal of Luxemburg brought France and Prussia almost to the point of war. In 1870 Prince Leopold of Hohenzollern consented to become a candidate for the then vacant Spanish throne. This was opposed by the French emperor, who demanded not only that the candidate should withdraw, but that the King of Prussia should pledge himself not to permit any such future candidature. This being refused, war was declared by France on July 15, 1870, with a most disastrous result to herself. (See *Franco-German War.*) After the German arms had proved entirely successful, on the invitation of the North German parliament supported by the South German states, the King of Prussia assumed on January 18, 1871, the title of German Emperor.

From this point the history of Prussia is, to a great extent, merged in that of the German Empire. In the hands of Prince Bismarck, acting as premier of Prussia as well as chancellor of the empire, a strong, central, autocratic government was maintained. Externally his policy was to secure Germany from attack by France or Russia, and in order to this alliances were made with Austria and Italy. Internally the legislation of Prussia has been chiefly remarkable in recent years for its anti-clerical and anti-social laws. In 1873 many clerical privileges were suppressed by the laws introduced and carried by M. Falk; but in 1880 an amendment to these was promoted by the premier, and later he greatly modified his opposition to the ultramontanes. The social-democrats also evoked the special antipathy of the Prussian premier, and their success at the elections, especially in Berlin, caused him to promote an anti-social law, which was vigorously applied. In his policy, both home and foreign, Prince Bismarck was supported by the Emperor William I until the death of the latter in March, 1888. He was succeeded by his son, Frederick III, who, when he ascended the throne, was struggling with a deadly throat disease. When he died in June, 1888, he was succeeded by his son, William II, who announced that he ruled by 'divine right,' and would suffer no interference with his authority. He discharged Bismarck from the chancellorship and through Prussia imposed a fatal war policy on the whole German Empire, terminating in the catastrophic European war (q. v.), 1914-18, when Prussia and the other German states suffered defeat.

Prussian Blue (prush'an), a cyanide of iron (Fe_7Cy_{18}) possessed of a deep-blue color, and much used as a pigment. It is also used in medicine.

Prussian Brown, a color obtained by adding a solution of the yellow prussiate of potash to a solution of sulphate of copper, which throws down a precipitate of deep brown. This, when washed and dried, is equal to madder, and possesses greater permanency.

Prussic Acid (prus'ik), called also *hydrocyanic* or *cyanhydric acid* (HCN), was discovered by Scheele in 1782, but first prepared in the pure state by Gay-Lussac in 1811. It is a colorless liquid which solidifies at 5° F.

to feathery crystals, and boils at 80°. Its specific gravity is about 0.7. It dissolves in all proportions in water, forming a liquid which reddens litmus-paper but slightly. It is found in the kernels of bitter almonds, peaches, apricots, plums, cherries and quinces; the blossom of peaches, sloes, etc.; the leaves of the beech, cherry, laurel; and various parts of other plants. Pure prussic acid is prepared by passing a stream of dry sulphuretted hydrogen over dry cyanide of mercury. This acid, which is one of the strongest poisons known, is used medicinally to remove various forms of irritation; but in all cases it must be used with extreme caution. When an overdose is administered death is instantaneous, and with a lesser dose the symptoms are convulsions or paralysis. The nature of its action is not clearly understood, but the best antidotes are found to be ammonia, chlorine-water, or a subcutaneous injection of atropine. See *Cyanogen*.

Pruth (pröth), a river of Europe which rises on the eastern side of the Carpathian Mountains, in the southeast of Galicia, flows circuitously east past Czernowitz, then S. S. E., forming the boundary between Roumania and the Russian government of Bessarabia, and enters the Danube on the left, about 12 miles below Galatz.

Prynne (prin), WILLIAM, pamphleteer and politician, born at Swanswick, Somersetshire, in 1600, and educated at Oxford, where he took his degree in 1620. He then removed to Lincoln's Inn, where he became a barrister, and in 1627 began with Puritan severity to attack prevailing fashions. For a volume denouncing stage-playing, entitled *Histrio-Mastix*, which was supposed to be leveled at the queen, he was condemned by the Star-chamber to pay a fine of £5000, to stand in the pillory and have both ears cut off, and to remain a prisoner for life. While in prison he wrote another book, *News from Ipswich against Laud*, and being condemned again to another fine of £5000, and to lose the remainder of his ears, had the stumps cut off, and was branded on both cheeks. The Long Parliament in 1640 granted his release. Soon after he entered Parliament and took a prominent part in the trial of Laud. After the fall of Charles I Prynne opposed Cromwell, who had him again imprisoned. At the Restoration he was appointed keeper of the records at the Tower, and died in 1669. He was a most voluminous writer. He had much learning and indefatigable industry, but was very deficient in judgment.

Prytaneum (prit-a-nē'um), a public hall in ancient Greek states and cities serving as the common home of the community. That of Athens was the most famous. Here the city exercised the duties of hospitality both to its own citizens and strangers. The prytanes or presidents of the senate were entertained in it, together with the citizens who, whether from personal or ancestral services, were honored with the privilege of taking their meals at the public cost.

Przemysl (prshem'isl), a town of Austrian Galicia, on the river San, 51 miles west of Lemberg, and 140 east of Cracow. It has two ancient cathedrals and several cloisters; and has been strongly fortified. It was taken by the Russians in 1914, and lost again to the Germans. Pop. 54,869.

Przhevalski, or PRJEVALSKI (pzhā-vāl'ske), COLONEL N., a Russian traveler, born in 1839. He became an army officer and was employed on numerous and important government exploring expeditions, usually accompanied by an armed force. The results of his explorations in Asia are of the highest value. He died in 1888.

Psalmanazar (sal-ma-nā'zar), GEORGE, the assumed name of a literary impostor, born of Catholic parents in the south of France about 1679; died in 1763. He studied among the Dominicans, acted as a private tutor; became a common vagrant, and at length assumed the character of a Japanese convert to Christianity, a character which he changed to that of a converted heathen native of the island of Formosa. At this time he became acquainted with a clergyman named Innes, who brought him to London as a convert to the Church of England. Under the patronage of Bishop Compton he translated the Church Catechism into a language which he invented and called Formosan, while he also published a so-called authentic *History of Formosa*. Various scholars had doubts of his pretensions, and at last he confessed his imposture. For many years after he resided in London, and employed his pen in writing for the booksellers. His *Autobiography*, published after his death, expresses great penitence for his deceptions. Dr. Johnson had a high opinion of his character and abilities.

Psalmody (sä'mu-di, sal'mu-di), the art and practice of singing psalms. The composition of psalm tunes

and the performance of psalmody appears to have been practiced and encouraged in Germany, France, and the Low Countries before it was introduced into Britain. In France psalmody was popularized at the Reformation by Clement Marot and Claude Goudimel, the former of whom translated the *Psalms of David* in verse, while the latter set them to music. Psalm-singing was introduced by the Reformers; but Calvin discouraged any but simple melody, while Luther practiced and favored part harmony, as did also John Knox in his psalter. The first English version of the *Psalms of David*, which appeared soon after that of the French, was made in the reign of Henry VIII, by Thomas Sternhold, groom of the robes to that monarch, and John Hopkins, a schoolmaster, assisted by William Whittyngham, an English divine. It was afterwards superseded by the version of Nahum Tate, the poet laureate, and Dr. Nicholas Brady. The first important compilation of psalm tunes for four voices was published in 1621 by Thomas Ravenscroft, Mus. Bac., and included such well-known tunes as *Bangor*, *St. David's*, *Norwich*, *York*, etc. Sternhold and Hopkins' version of the *Psalms* was first used in Scotland, and was afterwards superseded by the version now in use, founded on that of Francis Rous, provost of Eton, a member of Cromwell's government.

Psalms (samz), Book of, one of the books of the Old Testament, containing the liturgical collection of hymns used by the Jews in the temple service. Each psalm in the collection, with a few exceptions, has a particular superscription, such as *Maschil*, instruction, *michtam*, memorial, etc. The chronology of the psalms is much disputed. The earliest (Psalm xc) is said to have been written by Moses, many are attributed to David. a few are supposed to have been written on the return from the captivity, and some are assigned to the time of the Maccabees, but evidence as to their actual origin is greatly lacking. There is an ancient division of the psalms into five books, viz. i-xli; xlii-lxxii; lxxiii-lxxxix; xc-cvi; cvii-cl, which many critics look upon as indicating five distinct collections. Those who take this view place these collections in chronological order as they stand; but this method is considered by the latest criticism to be unwarranted by the internal evidence of each particular psalm. Nearly eighty are popularly assigned to David, twelve to the singer Asaph, some fourteen to the sons of Korah, two have the name of Solomon, and one is supposed to have been written by Moses. The opinion that some of the psalms are of the time of Samuel has no historical authority, while those by unknown authors are apparently of the latest date. In the Old Testament there are 150 psalms, but in the Septuagint and Vulgate psalms ix and x and civ and cv are united, while cxvi and cxlvii are divided, so that the numbering differs from the English version. In structure the psalms have the strophe and antistrophe which is so characteristic of Hebrew poetry. It would also seem that many of them were meant to be sung in parts, the chief part by the officiating priest, and a responsive part by the people. The *Book of Psalms* as we have it is essentially the hymn-book of the second temple, and according to the latest criticism, was ascribed to David, merely because the order of the worship in the second temple was the same as that prescribed by him for the first temple.

Psalter (sạl'tėr), specifically, the version of the Psalms in the *Book of Common Prayer;* also applied in the Roman Catholic Church to a series of devout sentences, 150 in number, and to a large chaplet or rosary with 150 beads, agreeing with the number of the psalms.

Psaltery (sạl'tėr-i), or Psalterion, an instrument of music used by the Hebrews, the form of which is not now known. That which is now used is a flat instrument in the form of a trapezium or triangle truncated at the top, strung with thirteen chords of wire, mounted on two bridges at the sides, and struck with a plectrum or crooked stick, thus resembling the dulcimer (which see).

Psammetichus (sam-met'i-kus), a king of Egypt who died about 617 B.C. He was one of the twelve kings who reigned simultaneously in Egypt for fifteen years after the expulsion of the Æthiopian dynasty; but being suspected by the other kings of aiming at sole sovereignty he was driven into banishment. With the aid of some Greek mercenaries, however, he defeated the other kings in a battle fought at Momemphis, on the east side of Lake Mareotis, after which he became the sole king of Egypt (671 or 670 B.C.), and the founder of a new dynasty.

Psara, now Ipsara (*Psyra*), an island of Turkey, in the Grecian Archipelago, 7 miles northwest of Scio, about 5½ miles in length, and as many in breadth.

Pseudepigrapha (sū-de-pig'ra-fa; Greek, false additional writings), a term applied in bib-

liography to a great number of books and fragmentary writings whose claim to a place in the Old and New Testament canons has been denied. Unlike the apocryphal and deutero-canonical books, the pseudepigrapha have no value unless to prove the capacity for forgery which was possessed by the Jew, Gnostic and Christian of ancient and mediæval times. Among these Old Testament forgeries may be mentioned, *The History of Asenath, The Preaching of Noah, The Book of Elias, The Testament of the Twelve Patriarchs, The History of Antiochus, Book of Lamech, Apocalypse of Adam*, etc.; while among the New Testament books are the false gospels of *James, Matthias, Thomas, Nicodemus, Andrew, History of Joseph the Carpenter, Nativity of Mary, Acts of the Apostles*, etc.

Pseudomorph (sū′dō-morf), a mineral having a definite form, belonging not to the substance of which it consists, but to some other substance which has wholly or partially disappeared. Sometimes quartz is found in the form of fluorspar crystals, the fluorspar having been changed by a process of replacement or substitution into quartz.

Pseudopodia (sū-do-pō′di-a), in zoology, the organs of locomotion characteristic of the lower Protozoa. These consist of variously-shaped filaments, threads, or finger-like processes of sarcode, which the animal can thrust out from any or every part of its body. See *Protozoa*.

Psid′ium. See *Guava*.

Psittacidæ (sit-as′i-dē), the parrot tribe, a family of scansorial birds, comprising over 300 species, of which the genus *Psittăcus* is the type. See *Parrot*.

Pskov (pskof), or PLESKOV, a government of Russia, bounded by those of Petrograd, Novgorod, Tver, Smolensk, Vitebsk, Livonia; area, 16,678 square miles. The whole government belongs to the basin of the Baltic, the South Dwina, which drains the southeast, carrying its waters into the Gulf of Riga, and the Velikaia, Chelon and Lovat, with other small tributaries, carrying the rest of the drainage into the Gulf of Finland. The soil is throughout of poor quality, wheat is seldom grown, and the principal crops are oats and barley. Forests are extensive, and the pine furnishes the means of manufacturing large quantities of pitch. Pop. 1,136,540.— PSKOV, or PLESKOV, the capital, is situated on the Velikaia, on which there is regular communication by steamer with Dorpat. It consists of the Kremlin, the Central city, the Great city, and a considerable suburb. Among the chief buildings are the cathedral, and the palace of the ancient princes of Pskov, now occupied by the archbishop. The principal manufacture is Russian leather. Pop. (1913) 36,000.

Psoas (sō′as), an important muscle of the human body which extends from the lumbar region to the thigh-bone, and assists in the movements of the thigh.

Psoralea (so-ra′le-a), a genus of leguminous plants, one species of which (*P. esculenta*) is the breadroot of N. America.

Psoriasis (sō-rī′a-sēs), a kind of skin disease, in which elevated red patches appear covered with large scales, there being often cracks or fissures between, from which blood may ooze. In some cases it is a syphilitic affection. The name is also given to the itch.

Psyche (sī′kē; Greek, *psychē*, the soul), a sort of mythical or allegorical personification of the human soul, a beautiful maiden, whose charming story is given by the Latin writer Apuleius. She was so beautiful as to be taken for Venus herself. This goddess, becoming jealous of her rival charms, ordered Cupid or Love to inspire her with love for some contemptible wretch. But Cupid fell in love with her himself. Many were the trials Psyche underwent, arising partly from her own indiscretion, and partly from the hatred of Venus, with whom, however, a reconciliation was ultimately effected. Psyche by Jupiter's command became immortal, and was for ever united with her beloved.

Psychical Research the investigation of that large group of debatable phenomena designated by such terms as mesmeric, psychical, and spiritualistic. (See *Spiritualism.*) The British Society for Psychical Research was founded in 1882. An American society, founded 1885, became a branch of the British organization, but in 1906 again became a separate society. Dr. J. H. Hyslop (q. v.) was for many years at the head of the American society.

Psychoanalysis (sī′kō-a-nal′i-sis), the name originally given by Prof. Sigmund Freud (q. v.) to a system of psychotherapy which he developed. It is a method of psychological investigation designed for the purpose of discovering the unconscious psychic forces which are the bases of normal and abnormal psychic manifestations. Psychoanalysis was originally designed for the cure of those cases of mental diseases which are known as hysteria, neurasthe-

nia, etc. It assumes that there are definite reasons for all normal and abnormal mental activities, that no psychoneurotic symptoms are accidental or meaningless, but that they have always unconscious underlying causes which if found and brought to the surface become dissipated and cause the symptoms to disappear. With this assumption Freud evolved his theory of repression which is the main pillar upon which rests the edifice of psychoanalysis. The theory in brief is that the psychoneurotic symptom depends on past emotional experiences of a painful or disagreeable nature which were forgotten or repressed into a mental field called the unconscious. Among representatives of scientific psychoanalysis in the United States may be mentioned A. A. Brill, S. E. Jelliffe, J. J. Putnam, etc.

Psychology (sī-kol'o-ji), the science that treats of the mind. The two largest divisions of modern psychology are pure and applied psychology. Pure psychology is sometimes called general psychology though this latter is more properly contrasted with individual, variational, or differential psychology. The aims of all divisions, with varying degrees of emphasis, are (1) to contribute to pure science systematic descriptions and explanations of mental processes and of behavior, and (2) to contribute to applied science (*a*) a basis for 'predicting human activity with reasonable certainty' and (*b*) a 'formulation of laws and principles whereby man's actions can be controlled by organized society.'

Psycho-physics, the forerunner and still an important branch of experimental psychology, involves the mathematical expression of the relation of changes in the physical world to conscious processes. It comprises mental measurements as a pure science. Weber's Law of the limen, or threshold of difference, that weight stimuli must vary by at least one-twentieth in order to produce a variation in sensation, sound stimuli by one-third, etc., is one of its significant discoveries. These principles are directly applied today in the psychology of advertising. Some authorities include in psycho-physics all problems of quantitative psychology, *e. g.*, measurements of feelings and their physical accompaniments, of reaction times, etc.

Physiological Psychology, or psychobiology, developed by Helmholtz, James and others, the next modern branch to develop, is strictly that field of investigation where physiology and psychology overlap. It contains such problems as the evolution and anatomy of the eye in relation to color-blindness, the location of pain, pressure, warm and cold spots in the skin, and the special function of the various parts of the brain and nervous system. Modern behavior psychology emphasizes the study of the physiology of the organism as a whole in relation to mental facts, *e. g.*, the bodily effect of emotional disturbances, but lays less stress upon neural anatomy.

The dominant viewpoint of modern psychology as the study of immediate experience with the aid of the experimental method and of physiological observations was formulated by Wundt in 1874. In 1879 he established at Liepsic the first psychological laboratory, in which he continued and developed the work of Weber and of Fechner, the founders of psychophysical methods of research. The laboratory method developed rapidly in Germany and in the United States, and later in the other European countries. Today the leading universities and colleges, as well as many of the smaller ones, have well established psychological laboratories. In the United States there are over thirty such psychological laboratories, including several in industrial plants.

Experimental Psychology, developed by Ebbinghaus, Galton, and others, sometimes still spoken of as 'the new psychology' in contrast to rational psychology or mental philosophy, has developed a laboratory technique for analyzing the individual mind comparable in precision to that of the physicist's laboratory. Many of the measuring instruments, *e. g.*, the chronoscopes, pitch instruments, color mixers, etc., are identical with his. The ergographs and kymographs for measuring and recording muscular work and fatigue, are also standard instruments in laboratories of physiology, where the instruments for brain anatomy are now usually found.

Distinctively psychological experiments include the measurement (1) of immediate mental grasp or 'attention span' with the aid of tachistoscopes or exposure instruments, (2) of speed and accuracy of movement with the aid of tapping boards and electrical counters and recorders, (3) of perception and hallucination with the aid of a dark room and light projector, or sound-proof room and audiometer, an instrument also sometimes used to measure deafness. This latter psychological instrument and many others have been adopted by certain medical specialists for very accurate examinations of the senses, etc.

Precise investigations of certain mental processes, paradoxically the more complex processes, are carried on without the aid of equipment other than paper and pencil, and sometimes standardized cards, pic-

tures, etc. The primary laws of mental association — contiguity, similarity and contrast and the secondary laws of primacy, frequency, intensity and recency— have been discovered through such experimentation. The regrouping of memory fragments, the feeling of strangeness, and the eye-fixations characteristic of the imaginative process, the large rôle of kinesthetic symbols, *i. e.*, fragmental muscular memories in the mental life, and the dependence of clear reasoning upon a definite intellectual attitude or brain set, are typical findings of the experimental psychology of the higher thought processes.

Inasmuch as laboratory methods are being developed in practically every phase of psychology, some authorities recommend that the term 'experimental' no longer be thought of as designating one branch of the science, but rather *the* fundamental method of investigation and verification. A similar recommendation is made for the term 'genetic.' The genetic method, the systematic observation of the development of mental processes and states, supplements the strictly experimental method and is employed in such fields as social psychology, where laboratory methods are of limited application.

Genetic, Comparative, or Behavior Psychology denote such fields wherein experimentation is usually limited to the objective or mental test procedure. Under these headings are included:

Animal Psychology, developed by Romanes, Thorndike, and others, the study of the behavior of the lower organisms from the micro-organisms up to the monkey, has included even researches in the tropisms or reactions of plants to light and other stimuli. One of the most characteristic experiments has been the study of the learning process in white rats and other animals placed in specially constructed mazes. Experimental zoölogy is indebted to animal psychology for many of its methods and results. The behaviorist school of psychology grew largely out of the researches in animal psychology.

Social Psychology, developed by Baldwin, McDougall, and others, investigates the behavior of the mob, of organizations, of nations, etc., and the influences of the group and individual mind, analyzing the influences of imitation, suggestibility, etc. It includes also race or folk psychology, which applies the genetic and to a certain extent the experimental method in the comparative study of peoples, especially of primitive groups as in the Torres Strait Expedition from the psychological laboratory of Cambridge University. Social Psychology is regarded by many authorities as fundamental to sociology and cultural anthropology. The psychogenetic study of mind in the evolution of the race is often characterized as ethnic or phylogenetic.

Child Psychology, and the psychology of adolescence, maturity and senility, constitute the ontogenetic studies. Darwin, G. Stanley Hall and Binet developed this division of the science which makes systematic and experimental observations of the original nature of man as revealed in infancy, of physical and mental growth periods with their critical transitional like puberty, of the growth of imagination, reasoning, etc., and of the gradual organization of the normal adult personality and its deterioration with age. Besides contributing vitally to other divisions of psychology, especially educational, abnormal, and normal adult psychology, child psychology is responsible for much of the progress in child welfare, experimental education, and mental measurements, notably through the Binet-Simon Scale for measuring the development of intelligence.

Abnormal Psychology deals with permanent and temporary deviations from ordinary intelligence, behavior, and consciousness. Genius and idiocy, mental health and criminal insanity, ecstasy and trance, are typical of the range of human problems investigated by the various methods of psychology in the other branches. One group of problems, the investigation of intelligence, of feeble-mindedness, and of organic insanity, is presented below in connection with clinical psychology. Another group, including automatic writing, clairvoyance, and telepathy, is investigated as abnormal states of persons in health. These same problems and the next group are also considered within the field of psychical research, which is not included in the field of psychology, even by men like Professor James, who was an authority in both fields. (See *Psychical Research.*) Closely allied with these are the problems of multiple personality or subliminal selves, subconscious and unconscious association and conflict, misconduct and delinquency, and functional nervous and mental disease states. These are being more and more approached through a new subdivision of abnormal psychology, known as psycho-analysis.

Psycho-analysis, or the Freudian psychology, though criticized with much hostility by many authorities, has been welcomed by others as affording the first satisfactory account of emotional experiences, certain forms of forgetting, of absent-mindedness, of slips of speech, and of wit, as well as throwing new light on practically all the problems considered by abnormal psychology, especially dreams,

sexual disturbances, misconduct, and hysterical states. Abnormal psychology, both pre-Freudian and post-Freudian, have been making valuable contributions to (some authorities would say revolutionizing) criminology, the understanding and treatment of the insane, and the sciences of mental hygiene. (See *Mental Hygiene*, etc.) Were it not that the study of the abnormal is profoundly modifying general psychology, much of its work might well be classified under applied psychology because of the immediately practical purpose of much of its investigation.

Applied Psychology, including all the technical uses of the science, such as mental tests, is sometimes described as psycho-technology. It includes educational, clinical, economic, and cultural psychology. The psychology of industrial management and advertising, of art appreciation, and religion, are included under the last two divisions.

Educational Psychology, developed by Thorndike, Dewey, and others, includes the technical applications of child psychology and investigates especially individual differences and the learning process. Utilization of nascent instincts, plateaus in habit formation, economical methods of memorizing, successful selection in reasoning, are among its specific problems. In conjunction with its offshoots, experimental education and educational research, it considers the development of scales for measuring classroom products, the efficiency of various methods of training and teaching, and the school grouping and vocational guidance of pupils on the basis of inherent abilities and aptitudes. In investigating the finer aspects of the last problem the services of consulting psychologists, both clinical and industrial, are requisitioned.

Clinical Psychology, developed by Franz, Healy, Witmer, and others, which includes the technical applications of abnormal psychology (see above), investigate by individual examination the mental states of a given individual—especially the exceptional, formulates and standardized methods of conducting such examinations, and endeavors to prescribe, frequently with the aid of psychiatrists and social workers, educational, vocational, and social programs for the improvement of the individual. Psychological clinics or psychological departments of mental clinics are usually established in all the larger universities and cities in connection with departments of education, health, and welfare or charities, and bureaus of associated charities.

Mental Tests, developed by Cattell, Whipple, and others, apply in part the methods of experimental psychology (see above) to the examination and measurement of traits, especially the gifts and handicaps of the individual. Variational or differential psychology is based chiefly on mental tests. Being briefer, less analytical, and not introspective, they are applicable to children, primitive people, animals and to adults in practical situations where laboratory conditions are impossible. On the other hand, mental tests aim to set precise tasks under standard conditions and to measure quality and quantity of performance. The seashore series of measurements of a singer involve tests of pitch discrimination, sense of rhythm, memory of songs, etc. The army trade tests measure familiarity with and skill in handling machinery, etc. Both series represent some of the best mental tests outside of intelligence testing, wherein the widest use of mental tests have been made.

Intelligence Tests measure the general capacity of the individual to adjust his behavior to new situations. Such tests aid in determining his degree of mental superiority, of feeble-mindedness, or of dementia. They have proved of definite value as one phase of educational and vocational guidance and constitute an important part of clinical psychology (see above). The standard intelligence test is the Binet-Simon scale (see below). Group intelligence tests, first widely employed in the National Army, have since been adopted by school systems, employment departments, and by many colleges as an alternative for the traditional college entrance examination.

The Binet-Simon Scale, developed by Kuhlman, Melville and Terman, in its latest form consists of ninety brief tasks and questions, *c. g.*, executing three orders, detecting blunders in absurd statements, defining words, etc. These are graded according to the age at which they are passed by the average individual, from three months up to eighteen years. The score or age level attained is frequently called the 'mental age.' This mental age, divided by the actual age, is called the 'I. Q.' or 'intelligence quotient.' However, great care must be exercised in interpreting these Binet mental ages, especially with persons above twelve years of age. In the National Army the average soldier made a score of thirteen and a half on the Binet Scale. Intelligence tests do not directly test character traits or detect mental ill-balance.

Economic or Industrial Psychology, developed by Scott, Munsterberg and others, applies some of the methods and results of clinical and experimental psychology to commercial and industrial problems. Many employment departments are using intelligence and trade tests, job analyses, and

personnel systems, developed in the Personnel Division of the army, an outgrowth of the work being carried on in the Carnegie Institute of Technology and elsewhere in selecting mechanics, clerks, salesmen, etc. Researches in the psychology of advertising, supported by professional advertisers, investigate methods of securing and holding attention, the psychological value of space, etc. Psychologists in industrial plants are investigating such problems as improved illumination, etc. The experimental study of designs and other art effects falls both within the realm of economic and cultural psychology.

Cultural Psychology, developed by Fechner, James, Stratton, and others, embraces various applications not included in the three preceding divisions of applied psychology. The varieties of aesthetic and religious experience have constituted the chief interests in this field. Here also belong the scientific applications of psychology in approaching the problems of philosophy. This represents the reverse movement from pre-scientific psychology which was approached by the philosophic method. Such psychology was called the philosophy of mind. The philosophy of pragmatism with its sub-divisions, pragmatic logic, ethics, etc., has grown out of the modern psychological approach to such philosophic problems as causation, the freedom of the will, the validity of knowledge, etc. See also *Philosophy, Association of Ideas, Emotions, Feeling, Imagination* and *Memory, Mind, Sensation, Hallucinations, Perception, Will*, etc.

Psychotherapy (sī-kō-thėr'a-pi), or Psychotherapeutics, the practice of treating the sick by influencing the mental life. Some physicians claim that it is a valuable aid in their practice. Theologians have combined it with religion, notably Dr. Elwood Worcester, of the Emmanuel Church, Boston, who established what was known as the Emmanuel Movement, in 1906, and organized a class for the treatment of nervous disorders through mental healing. (See also *Psychoanalysis*, the form of mental healing developed by Freud, in the treatment of hysteria.)

Ptarmigan (tär'mi-gan), the common name of birds belonging to the family Tetraonidæ (grouse and partridges). The species inhabit northern arctic and sub-arctic regions, being mostly brown, black and white in summer, and turning to pure white with black tail in winter. The common ptarmigan (Lagopus lagopus) of North America and Europe, called also willow grouse, is 16 inches long. The Scottish ptarmigan (L. vulgaris) is smaller and inhabits northern Britain and Scandinavia. Other species inhabit northern Russia and British America.

Pterichthys (te-rik'this), a fossil genus of fishes belonging to the Old Red Sandstone. The pterichthys was peculiarly characterized by the form of its pectoral fins, which were in the form of two long, curved spines, something like wings (whence the name—'wing-fish'), covered by finely tuberculated ganoid plates.

Pteridophyta (ter-i-dof'i-ta), the fern plants, comprising three orders: (1) the Filicales, or ferns; (2) the Equisetales, or horsetails; and (3) the Lycopodiales, or club-mosses.

Pteris (tē'ris), a genus of ferns to which the common brakes or bracken belong.

Pterodactyl (ter-o-dak'til; 'winged finger'), a genus of extinct flying reptiles of the order Pterosauria, found in the Jura Limestone formation, in the Lias at Lyme-Regis, in the Oölite slate of Stonefield, etc. The pterodactyls had a moderately long neck, and

1, Pterodactyl (restored). 2, Skull of *Pterodactylus longirostris.*

a large head; the jaws armed with equal and pointed teeth; most of the bones, like those of birds, were 'pneumatic,' that is, hollow and filled with air; but the chief character consisted in the excessive elongation of the outer digit (or little finger) of the forefoot, which served to support a flying membrane. A number of species have been discovered, most of them small or of moderate size, but one must have had a wing expanse of 20 feet.

Pteropoda (ter-op'o-da), a class of molluscs, comprehending those which have a natatory, wing-shaped expansion on each side of the head and neck, being thus a sort of 'winged snails.' They are all of small size, are found floating on the surface of the ocean in all parts of the world, and in the Arctic and Antarctic regions furnish much of the food of the whale. They are all her-

maphrodite. Their food consists of minute animals.

Pterosauria (ter-o-sạ′ri-a), an extinct order of reptiles, represented chiefly by the Pterodactyls (which see). This group is especially noted as containing forms which possessed the power of flight.

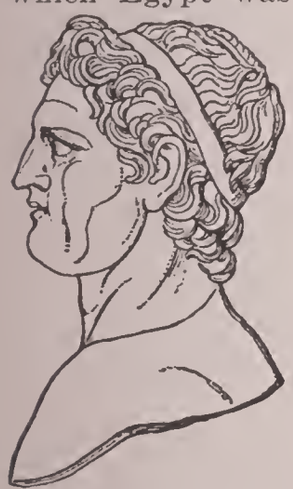
Pterygotus (ter-i-gō′tus), a gigantic fossil crustacean occurring chiefly in the passage-beds between the Silurian and Devonian systems. It has a long, lobster-like form, composed in the main of a cephalo-thorax, an abdominal portion of several segments, and a somewhat oval telson or tail-plate.

Pthah, or PHTHA (ftha), an ancient Egyptian divinity, the creator of all things and source of life, and as such father and sovereign of the gods. He was worshiped chiefly at Memphis under the figure of a mummy-shaped male, and also as a pygmy god.

Ptolemaic System (tol-e-mā′ik), in astronomy, that maintained by Claudius Ptolemy, the astronomer, who supposed the earth to be fixed in the center of the universe, and that the sun and stars revolved around it. This long-received theory was eventually rejected for the Copernican system. See *Astronomy*.

Ptolema′is. See *Acre*.

Ptolemy (tol′e-mi; PTOLEMAIOS), the name of a line of Græco-Egyptian kings, who succeeded, on the division of the empire of Alexander the Great, to the portion of his dominions of which Egypt was the head. They were also distinguished by the surname Lagidæ, from Ptolemæus Lagus, the founder of the dynasty. PTOLEMY I, called *Soter*, the Savior, was by birth a Macedonian. His mother was Arsinoë, the mistress of Philip, and his father is commonly reputed to have been Lagus, a Macedonian of humble birth. Ptolemy was one of the intimate friends of Alexander, attended the king on his expedition to Asia, was admitted into the bodyguard, and in 329 B.C. commanded one of the chief divisions of the army. On the death of Alexander he attached himself to the party of Perdiccan, and secured for himself the government of Egypt. He married Eurydice, daughter of Antipater, and in B.C. 320 he seized the satrapy of Phœnicia and Cœle-Syria. In 308 he invaded Greece, and proclaimed himself as a liberator; but he made little progress, and having garrisoned Corinth and Sicyon, which he lost some years later, he returned to Egypt. Antigonus resolved to wrest Cyprus from Ptolemy (B.C. 307), and in a sea-fight at Salamis the Egyptians were defeated, and Cyprus fell into the hands of the victor, who assumed the title of king. Antigonus now advanced against Egypt through Syria with a powerful army, supported by a fleet; but he was ultimately compelled to retire, while a few years later Cyprus was recovered and became a permanent dependency of Egypt. Ptolemy died in B.C. 283. He was a great patron of art, learning, and literature, and founded the celebrated Alexandrian library.— PTOLEMY II (*Philadelphus*), born B.C. 309, succeeded his father, and reigned in almost complete peace. His chief care as ruler was directed to the internal administration of his kingdom. He spared no pains to fill the library of Alexandria with all the treasures of ancient literature, and among the architectural works erected during his reign were the lighthouse on the island of Pharos, the Alexandrian Museum, and the royal burying-place. He founded numerous cities and colonies, and during his reign the dominion of Egypt extended into Ethiopia, Arabia, and Libya, and embraced the provinces of Phœnicia and Cœle-Syria, besides tracts in Asia Minor and some of the islands of the Mediterranean. Ptolemy died in 247, and was succeeded by his son — PTOLEMY III, surnamed *Euergĕtes* ('benefactor'). He was early engaged in an important war against Syria, in which he advanced without opposition to Antioch, then turned eastward, subduing Mesopotamia, Babylonia, etc. The fleets of Ptolemy had at the same time subdued the coasts of Asia Minor, and carried his arms to the Hellespont and to the coast of Thrace. Ptolemy took some part in the affairs of Greece against the rulers of Macedonia, and maintained friendly relations with Rome. Like his predecessors, he was the patron of scholars, and his court was the resort of the most distinguished men of his day. He died in B.C. 222, being succeeded by PTOLEMY IV, surnamed *Philopator*. His Syrian possessions having been gradually wrested from him by Antiochus the Great, Ptolemy put himself at the head of a large army and completely defeated Antiochus at Raphia, in B.C. 217. In later life he gave himself



Ptolemy I.— Antique gem.

up completely to debauchery, and died B.C. 205.— PTOLEMY V (surnamed *Epiphănes*), his son and successor, was under five years old at his father's death, and this led Philip of Macedon and Antiochus III (the Great) of Syria to combine to dispossess Ptolemy, and divide his dominions. To avert this danger the guardians of the young king placed him under the protection of Rome, which thus had first an occasion for interfering in the affairs of Egypt. Ptolemy was poisoned B.C. 181.— PTOLEMY VI (surnamed *Philomĕtor*) was a child at the death of his father. His reign was much disturbed by the rivalry of a brother, and being expelled from Alexandria he repaired to Rome B.C. 164, by whose intervention he was replaced. He died in B.C. 146. During the reigns of the succeeding Ptolemies the influence of the Romans in Egypt gradually increased, with a corresponding decrease in the independence of the native sovereigns. The personal character of the Ptolemies also degenerated, a fact to be probably connected with the common practice in the family for brothers to marry sisters.— PTOLEMY XI (*Aulētēs*, 'flute-player') was driven from his kingdom by his subjects, who were ground down by taxation; but he was restored by the Romans (to whom he gave great sums of money), and died B.C. 51.— PTOLEMY XII (*Aulētēs*), son of the preceding, reigned jointly with his sister Cleopatra till B.C. 48, when Cleopatra was expelled and, raising an army in Syria, invaded Egypt. On the arrival of Cæsar, Cleopatra by her charms acquired an ascendency over him. Ptolemy put himself at the head of the insurgents, was defeated by Cæsar, and drowned in attempting to make his escape, in B.C. 48 or 47.— PTOLEMY XIII (*Aulētēs*), the youngest son of Ptolemy XI, was declared king by Cæsar in conjunction with his sister Cleopatra in B.C. 47. He was married to his sister, but being only a boy possessed no more than the name of husband or king. Cleopatra caused him to be put to death, and the line of the Ptolemies ended when Cleopatra perished by her own hands after Octavius defeated Antony at Actium, and Egypt became a Roman province, B.C. 30.

Ptolemy (CLAUDIUS PTOLEMÆUS), a Greek astronomer and geographer of the second century after Christ. He appears to have resided in Alexandria, where he made astronomical observations in 139, and he was alive in 161. Ptolemy's great astronomical work is entitled *Megalē Syntaxis tōs Astronomias*, and is more commonly known by the Arabic title *Almagest*. His system, founded on the apparent movements of the heavenly bodies, and which is still known by his name, was finally superseded by that of Copernicus. See *Ptolemaic System*, *Astronomy*.

Ptomaine (tō'ma-in, mān), one of a class of alkaloids or organic bases, which are generated in the body during putrefaction, during morbid conditions prior to death, and even, it is said, during normal healthy conditions of life. It is considered highly poisonous, and has been mistaken for strychnine and other vegetable poisons by toxicologists.

Puberty (pū'ber-ti), the period in both male and female marked by the functional development of the generative system. In males it usually takes place between the ages of thirteen and sixteen; in females somewhat earlier; and, as a rule, in very warm climates puberty is reached somewhat sooner than elsewhere. In males puberty is marked externally by the deepening of the voice, the first appearance of the beard, greater firmness, fullness of the body, etc.; in females, by the enlargement of the breasts and by the general rounding out of the frame, and most unequivocally of all by the commencement of menstruation.

Publicans (pub'li-kanz), PUBLICANI (from *publicus*, belonging to the state), the farmers of the taxes levied in the territories of ancient Rome. Naturally they belonged to the wealthier classes, and were from their functions unpopular. Far more unpopular were the subordinates whom they employed to collect the taxes for them. In Palestine, from the strong spirit of nationality among the Jews, many of whom denied the lawfulness of paying tribute, these were specially obnoxious as the agents of the foreign rulers. To this detested class, and not to the *publicani* proper, the 'publicans' of the New Testament generally belonged.

Public Houses. See *Inn* and *Liecnse*.

Publicist (pub'li-sist), a term originally applied to a writer on international law, now used to denote a writer on current politics.

Public Lands. The United States possessed originally a vast area of public lands, the property of the government, added greatly to by every accession of territory, and given very freely to settlers for the purpose of development. Large quantities of these lands have also been donated to railroads, as in the instance of the Central Pacific. In 1860 the public domain included 1,055,911,288 acres. In addition to homestead

and railroad grants, much of this was given to new states, when admitted, for school and other purposes. In 1912 there remained, not including Alaska, 327,389,968 acres. Much of this remaining land is arid or semi-arid, yet the extension of irrigation has rendered a considerable portion of it suitable for agricultural purposes, and the area of settlement has increased in consequence. Recently the discovery of valuable coal, phosphate, petroleum and other deposits in the unsettled territory, and of sites suitable for water-power development, has led the government to withdraw large tracts from entry, under the newly developed idea that these treasures of the earth belong to the nation at large and should be held in the interest of all the people. Withdrawals of coal lands made during the administration of President Roosevelt amounted to 14,374,695 acres, and were added largely to by President Taft. The total withdrawal of coal lands, in addition to the large area withdrawn in Alaska, amounts to 36,073,164 acres, distributed through North Dakota, South Dakota, Colorado, Utah, Washington and Arizona. Other large withdrawals made by President Taft, under an act of Congress of 1910, were as follows: water-power sites, 1,454,499 acres, phosphate sites, 2.594,113 acres, and petroleum sites, 4,447,119 acres. This action has been taken to prevent these very valuable lands from being pre-empted by speculators, and awaiting legislation regarding their disposal. If handled in the public interest they may add enormously to the revenue of the government.

Public Library. See *Library.*

Public Schools, the schools established under any national system of education. In the United States the administration, organization and support of these schools depend upon the State Legislatures and city councils. Boards of Education in many States and cities have special charge of the schools. Three grades are commonly recognized — the primary, grammar, and high. Normal schools for the training of teachers are established in nearly all the States. The public schools of this country have made marked progress since their first institution less than a century ago, and are now in many cities in a high state of efficiency. Public school systems prevail in many of the countries of Europe, those of Germany being the most celebrated for their efficient management. They are of late introduction in the British Islands, where elementary education has long been under church control.

Publius Syrus (pub'li-us; more correctly PUBLILIUS), so-called because a native of Syria, was carried as a slave to Rome about the middle of the first century B.C., and became there a popular writer. His master gave him a good education, and afterwards set him free. He excelled in writing *mimi*, or farces, which were interspersed with moral sentences, and a collection of them was used by the Romans as a schoolbook. A number of apothegms, not all composed by him, have been published as *Publii Syri Sententiæ.*

Puccinia (puk-sin'i-a), a genus of fungi well known to farmers under the name of mildew. The rust, otherwise the mildew, of corn, is the *P. graminis.*

Puccini (pöt-chēn'ē), GIACOMO, Italian composer, born in Lucca, Italy, in 1858. He first came into public notice through his opera, *La Boheme* (1896). Other of his operas are, *Madame Butterfly* and *La Fanciulla del West.*

Puccoon'. Same as *Blood-root.*

Puck, a celebrated elf, the 'merry wanderer of the night,' whose character and attributes are depicted in Shakespere's *Midsummer Night's Dream*, and who was also known by the names of *Robin Goodfellow* and *Friar Rush.* He was the chief of the domestic fairies, and many stories are told of his nocturnal exploits.

Pückler-Muskau (puk'ler mös'kou), HERMANN LUDWIG HEINRICH, PRINCE OF, a German traveler and author, was born in 1785. He served in the Tuscan and Russian armies, and after the peace of 1815 devoted himself to literature, landscape gardening, and travel. One of his works was translated into English by Mrs. Austin as *Tour in England, Ireland, and France by a German Prince.* Other English translations of works by him are *Semilasso in Africa*, 1837; *A German Sketch-Book* (Tutti Frutti), 1839; and *Egypt under Mehemed Ali*, 1845. He died in 1871.

Pudding-berries, the berries of the Canadian dogwood (*Cornus Canadensis*), common throughout North America.

Pudding-stone, or PLUM-PUDDING STONE, a term now considered synonymous with conglomerate, but originally applied to a mass of flint pebbles cemented by a siliceous paste. When select specimens are cut and polished they resemble a section of a plum pudding, and are used for ornamental purposes. It is very common in and around Boston, Massachusetts.

Puddling Furnace. See *Iron.*

Pudsey (pud'zi), a town in the West Riding of Yorkshire, 6 miles west of Leeds. Woolen and worsted manufactures are extensively carried on, and there is also a large manufacture of boots and shoes. Pop. (1911), 14,027.

Puebla (pweb'la), in full La Puebla de los Angeles, the capital of a Mexican state of the same name, situated on a plateau 76 miles S. E. of Mexico. It has spacious streets and solidly-built houses, the cathedral being a magnificent structure. It contains a large number of religious edifices, many of them highly decorated. There are also several colleges, a museum, and a theater. It is one of the chief seats of Mexican manufacturing industry, and its chief products are cotton and woolen goods, leather, glass, earthenware, and soap. Puebla was built by the Spaniards in 1533-34. Pop. 96,121. The State consists of an elevated plateau, and contains much fertile soil. On the western frontier is the volcano of Popocatepetl, the highest mountain in Mexico. Area, 12,992 square miles; pop. 1,118,439.

Pueblo (pweb'lō), a city, county seat of Pueblo Co., Colorado, in the Arkansas Valley, 110 miles S. of Denver. It is a railroad center, having the Denver & Rio Grande, Rock Island, Colorado & Southern (C., B. & Q.), Colorado Kansas, Colorado & Wyoming, Missouri Pacific and Santa Fé. It has great steel plants, the largest zinc smelter in the world, gold and silver smelter, flour mill, tent and awning factory, brick works, and many other industries. Its climate is dry, equable and invigorating. It has splendid high schools, public library, court house, etc. Pop. (1910) 44,395; (1920) 42,908.

Pueblos, a semicivilized family of American Indians dwelling in Arizona and New Mexico. Their name is derived from *pueblo,* Spanish for 'village,' and they are peculiar in dwelling in enormous single habitations, some of them large enough to contain a whole tribe. These edifices are often 5 or 6 stories high, and from 400 to 1300 feet long, with a large number of rooms on each floor. They are commonly built of adobe, though in some cases of flat stones, and the ground floor has no doors or windows, entrance to its rooms being obtained by means of a ladder leading to the second story. Indoor ladders take the place of stairways. Each successive story recedes a few feet from the line of the one below it, thus giving the building a somewhat pyramidal aspect. Each family has a separate apartment and there are large rooms used for council chambers and tribal dances. In New Mexico there are 19 such villages, with over 8000 occupants. These till the land with much skill, irrigating their fields extensively. In addition to field crops, they raise horses, cattle and sheep. They also have the arts of spinning and weaving and pottery-making. The Moquis of Arizona are a related tribe, about 1800 in number, who live in villages built on the summit of mesas or steep, isolated hills, rendering assault by enemies difficult. These people were once far more numerous than at present, as is shown by the wide area over which the ruins of old pueblos and remains of pottery are found. They were first discovered in 1540 by Vasquez de Coronado, a Spanish adventurer, who had heard exaggerated stories of the splendor and riches of the 'seven cities of Cibola.'

Puerperal Fever (pū-er'per-al), a dangerous contagious disease peculiar to women in childbed, and due to the absorption of poisonous material by the raw surface of the womb. The poison may originate from decomposing material in the womb itself, then called *sapræmia;* but is generally introduced from without, *septicæmia.*

Puerperal Mania, is a form of insanity developed during pregnancy or after childbirth, and is invariably the effect of exhaustion or debility.

Puerto Cabello. See *Porto Cabello.*

Puerto de Santa Maria, commonly called El Puerto, a town of Spain, in the province and 5 miles northeast of Cadiz, on the Guadalete, near its mouth in the Bay of Cadiz. The town is pleasantly situated and is well built. There are several convents, a Jesuit college, a modern theatre and a large bull ring. A notable feature of the town is the *bodegas* or wine stores. El Puerto is the chief port for the export of sherry wines, being the nearest port to Jérez de la Frontera (*q. v.*), with which it is connected by rail. Among other industries are the manufacture of brandy and other liquors, glass, soap, flour, starch, and the exporting of fish. Pop., 1910, 17,984.

Puerto Montt (mōnt), a seaport of Southern Chile, capital of the province Llanquihue. Pop. 4140.

Puerto Principe (prēn'sē-pā), an old town in the interior of Cuba, early in the century the seat of the central government and supreme courts of justice of the Spanish

West Indies. Its chief manufacture is cigars. It is connected by railway with its port, San Fernando de Nuevitas, and is the capital of the province of Puerto Principe, also known as Camagüey, a fertile region of 10,500 square miles area. Pop. (1907) 29,616.

Puerto Real (rē'al), a Spanish seaport in the province and 7 miles east of Cadiz. Pop. 9683.

Puerto Rico. See *Porto Rico.*

Pufendorf, or PUFFENDORF (pö'fendorf), SAMUEL, BARON VON, a German writer on the law of nature and nations, born in 1632. He studied theology and law at Leipzig and Jena, and in 1660 appeared his *Elementa Jurisprudentiæ Universalis.* In 1661 he became professor of the law of nature and of nations at Heidelberg. In 1677 he published his work *De Statu Reipublicæ Germanicæ*, which, from the boldness of its attacks on the constitution of the German Empire, caused a profound sensation. In 1670 he went to Sweden, became professor of natural law in the University of Lund, and brought out his chief work, *De Jure Naturæ et Gentium*, and in 1675 an abstract of it, *De Officio Hominis et Civis.* In 1677 Pufendorf went to Stockholm as historiographer-royal. There he wrote in Latin his vigorous vindication of Protestantism, *On the Spiritual Monarchy of the Pope*, a *History of Sweden from the Campaign of Gustavus Adolphus in Germany to the Abdication of Queen Christina*, a *History of Charles Gustavus*, and in German his *Introduction to the History of the Principal States of Europe.* In 1686 he received a summons to Berlin from Frederick William, elector of Brandenburg, a history of whom Pufendorf wrote for his son, the first king of Prussia. In 1694 he was created a baron by the king of Sweden, and in the same year he died at Berlin. There are English translations of his principal works.

Puff-adder (*Vipĕra* or *Clotho arietans*), a serpent found in South and Central Africa. Its popular name is derived from its power of puffing out the upper part of the neck when irritated or alarmed. It is very thick, attains a length of 4 or 5 feet, and is extremely venomous. The Bosjesmen poison the arrows used by them in battle with its venom.

Puff'balls, so called from their globular shape, and because if they are struck when they are ripe the dry spores fly out in powder like a puff of smoke, form the genus of fungi *Lycoperdon.* When young, and whether raw or cooked, some of them are very good eating.

Puff'birds. See *Barbets.*

Puffin (puf'in), the name for the marine diving birds of the genus *Fratercŭla.* The common puffin (*F. Arctica*) is a native of the Arctic and northern temperate regions. It can fly with great rapidity when once upon the wing. It is about a foot in length, and from the singular shape and enormous size of

Common Puffin (*Fratercŭla arctica*).

its bill, which is striped with orange upon bluish gray, is often called the sea-parrot or the coulter-neb. Their plumage is glossy black, with the exception of the cheeks and under surfaces, which are white. It breeds upon rocks and in the rabbit warrens near the sea, and lays one egg, which is white. It lives on fish, crustacea, and insects, and is a gregarious and migratory bird.

Pugaree (pug'a-rē), PUGGERIE, the name in India for a piece of muslin cloth wound round a hat or helmet to protect the head by warding off the rays of the sun.

Pugatchef (pö-gà-chef'), YEMELYAN, the son of a Don Cossack, was born in 1726, and became in his youth the leader of a band of robbers. During the Seven Years' war he served in the Russian, Prussian, and Austrian armies successively. Returning to Russia, he attempted to stir up an insurrection, but was arrested and imprisoned. Having made his escape, he pretended to be the murdered czar, Peter III, to whom he bore a strong personal resemblance. He was joined by numbers of the peasantry, to whom he promised deliverance from their oppression. After several considerable successes, accompanied by frightful cruelty on his part, he found himself at the head of 15,000 men, and was threatening Moscow itself when, betrayed by his followers and separated from his army, he was captured, and in June, 1775, executed at Moscow.

Pug'dog, a small dog which bears a miniature resemblance to the bulldog, and is only kept as a domestic pet.

Puget Sound (pū'jet), a large inlet, or arm of the Pacific Ocean, on the northwest coast of the State of Washington, forming the southwest continuation of Juan de Fuca Strait, with which it is connected by Admiralty Inlet. It is navigable by large ships, penetrates far into the interior, and is divided into several branches, which afford great facilities for navigation. On its shores are Seattle, Olympia, and other rising towns.

Pugilism. See *Boxing*.

Pugin (pū'jin), AUGUSTIN NORTHMORE WELBY, architect, was born in 1811, the son of Augustus Pugin (see next article), from whom he imbibed a love of Gothic architecture, to promote the revival of which became early the object of his life. In 1834 he became a Roman Catholic, and designed a large number of ecclesiastical buildings for that communion, among them a church at Ramsgate, which was built at his own expense. He assisted Sir Charles Barry in the designs for the new houses of parliament, especially in those for their interior fittings and decorations. The *Contrasts, or a Parallel between the Architecture of the Fifteenth and Nineteenth Centuries* (1836), the *True Principles of Pointed or Christian Architecture* (1841), and *The Glossary of Ecclesiastical Ornament and Costume* (1844), are among his principal works. He died at Ramsgate in 1852.

Pugin, AUGUSTUS, architectural draughtsman, father of the above, was born in France in 1762, but settled early in life in London, where for many years he acted as assistant to Nash, the architect. The revival of Gothic architecture in England was much aided by his *Specimens of Gothic Architecture* (1821-23) and others of his works. Among these were the *Picturesque Tour of the Seine* (1821) and *Specimens of the Architectural Antiquities of Normandy* (1825-28). He died in 1832. His representations of Gothic architecture, for beauty, accuracy, and thorough mastery of the subject, have never been excelled.

Pug-mill, a machine for mixing and tempering clay. It consists of a hollow iron cylinder, generally set upright, with a revolving shaft in the line of its axis, carrying a number of knives projecting from it at right angles, and arranged in a spiral manner. The clay is thrown in at the top of the cylinder, and by the revolution of the shaft is brought within the action of the knives, by which it is cut and kneaded in its downward progress, and finally forced out through a hole in the bottom of the cylinder.

Puket (pö-ket'), a town and province (*monthon*) of Siam, on Puket or Junk Ceylon Island, off W. coast of Malay Peninsula. It has rich tin mines. Pop. of town, 20,000; province, 233,052.

Pulaski (pö-läs'ki), CASIMIR (1748-79), a Polish patriot and American Revolutionary officer. After serving in the Polish army against the Russians he came to America and joined the patriot army in 1777. He was killed at the siege of Savannah in 1779.

Pulaski, a town, county seat of Pulaski Co., Virginia, 59 miles w. of Roanoke. It has zinc and iron smelters, furnaces, etc. Pop. (1920) 5282.

Pulci (pul'chē), LUIGI (1432-84), an Italian poet, born at Florence, friend of Lorenzo the Magnificent (see *Medici*). *Il Morgante* is his best-known work.

Pulitzer (pū'lit-zėr), JOSEPH, American editor and publisher, born in Budapest, Hungary, in 1847; died in 1911. In 1864 he drifted to the United States, entered newspaper work in St. Louis and became rapidly successful. In 1883 he bought the New York *World* and made it the first successful exponent of popular journalism. Four years later he lost his sight. He endowed a school of journalism at Columbia University.

Pulley (pụl'i), a small wheel movable about an axle, and having a groove cut in its circumference over which a cord passes. The axle is supported by a kind of case or box called the *block*, which may either be movable or fixed to a firm support. The pulley is one of the

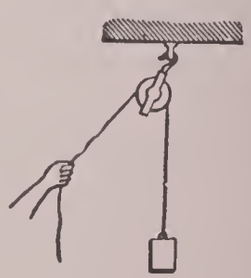


Fig. 1.

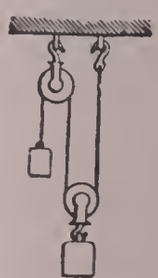


Fig. 2.

six simple machines or mechanical powers, and is used for raising weights. A single pulley serves merely to change the direction of motion, but several of them may be combined in various ways, by which a mechanical advantage or pur-

chase is gained, greater or less, according to their number and the mode of combination. The advantage gained by any combination or system of pulleys is readily computed by comparing the velocity of the weight raised with that of the moving power, according to the principle of virtual velocities. The friction, however, in the pulley is great, particularly when many of them are combined together. A pulley is said to be fixed when the block in which it turns is fixed, and it is said to be movable when the block

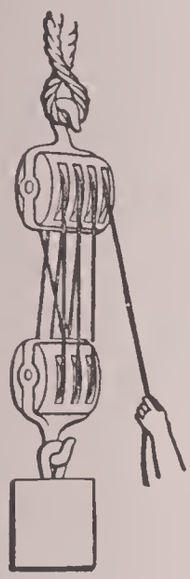


Fig. 3.

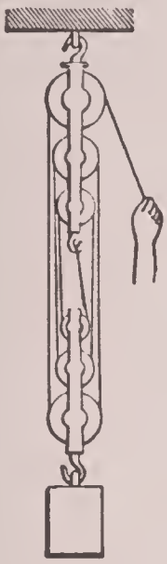


Fig. 4.

is movable. In the single fixed pulley (fig. 1) there is no mechanical advantage, the power and weight being equal. It may be considered as a lever of the first kind with equal arms. In the single movable pulley (fig. 2) where the cords are parallel there is a mechanical advantage, there being an equilibrium when the power is to the weight as 1 to 2. It may be considered as a lever of the second kind, in which the distance of the power from the fulcrum is double that of the weight from the fulcrum. In a system of pulleys (figs. 3, 4) in which the same string passes round any number of pulleys, and the parts of it between the pulleys are parallel, there is an equilibrium when the power is to the weight as 1 to the number of strings at the lower block. In a system in which each pulley hangs by a separate cord and the strings are parallel (fig. 5), there is an equilibrium when the power is to the weight as 1 to that power of 2 whose index is the number of movable pulleys (in the case here illustrated $1:2^3$ or 1:8). Whatever be the mechanical arrangement of the pulleys and of the ropes, the principle of all pulleys is the same, namely, the transmission of the tension of a rope without sensible diminution so as to obviate the loss of force consequent on rigidity. The term pulley is used indifferently to denote either a single sheave or the complete block and its sheaves. In machinery, a pulley is a wheel, generally with a nearly flat face, which being placed upon a shaft transmits power to or from the different parts of the machinery, or changes the direction of motion by means of a belt or band which runs over it.

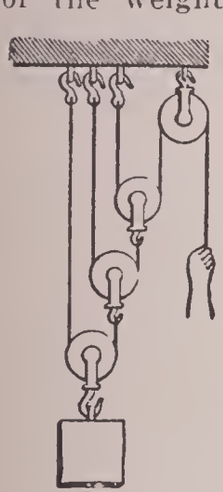


Fig. 5.

Pullman (pul'man), GEORGE M., inventor, born in Chautauqua Co., New York, in 1831. At 22 he contracted for removing warehouses on the Erie canal; afterwards in Chicago for raising entire blocks of brick and stone buildings. In 1859 he made his first sleeping-car, now developed into the car known all over the world — especially adapted for sleeping in, or as a drawing-room or dining-car. The industrial town of Pullman, in the State of Illinois, was founded by him, to improve the social surroundings of his workmen. He died in 1897.

Pulmobranchiata (pul-mo-brank-i-ā'ta), an order of gasteropod molluscs (also called by some naturalists Pulmonata), in which the respiratory organ is a cavity formed by the adhesion of the mantle by its margin to the neck of the animal. The greater part of them are terrestrial, among these being the snails and slugs.

Pulmonary Consumption. See *Consumption.*

Pulmona'ta. See *Pulmobranchiata.*

Pulmotor, an instrument used for producing artificial respiration in cases of suffocation, gas inhalation, drowning, etc. There are various devices used for this purpose, the pulmotor using air containing 60 per cent. of oxygen, while the Dr. Pret apparatus uses pure oxygen. Other devices are known as the lung motor and the salvator. None of these are free from danger, and in the hands of the inexperienced may hasten death instead of restoring life. They should not be used more than a few minutes at a time, manual methods of inducing artificial respiration being employed in the intervals.

Pulo-Nias, same as Nias (which see).

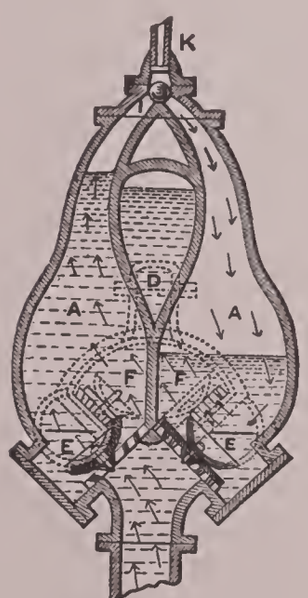
Pulo Penang. See *Penang.*

Pulpit (pụl'pit), the elevated enclosure or desk in a church from which the preacher delivers his discourse. The *pulpitum* of the ancient Roman theaters was that part of the stage where the actors performed.

Pulque (pụl'kā), or Octli, a favorite drink in Mexico and Central America, made from the juice of various species of agave, pleasant and harmless until after protracted fermentation, when it becomes an intoxicant. A kind of brandy is also distilled from it.

Pulse (puls), leguminous plants or their seeds, including all kinds of beans, pease, lentils, etc. The considerable proportion of nitrogen which they contain makes them very nutritious, and on that account they are much eaten, with or without rice, in India, where the chick-pea (*Cicer arietinum*) is one of these very largely used. The Hebrew word translated pulse in the authorized version of the Bible, Daniel, i, 12, 16, probably means edible seeds in general.

Pulse, the throbbing movement of the walls of blood-vessels, from the passing waves of blood due to the beats of the heart. It is limited in healthy conditions to the arteries. In the newly-born child the healthy pulse registers 130 to 140 beats a minute; at two years of age 105, at ten years about 90, at fifteen to twenty about 70; while in old age it may sink to about 60. In females it is somewhat higher than in males, and during certain fevers it sometimes reaches 140 beats per minute. In arteries which lie immediately under the skin it can be felt with the finger, as is the case with the radial artery, the pulsation of which is very perforce and frequency of the action of the heart.



Pulsometer.

Pulsometer (pul-som'e-ter), an instrument of the pump kind for raising water, especially when that liquid is mixed with solid matter. It acts by the condensation of waste steam sent into a reservoir, the water rushing up into the vacuum formed by the condensation. From the accompanying figure it will be seen that it consists essentially of a double chamber, or two connected chambers, A A, having a ball-valve 1 at top (which shuts either chamber alternately) and clack-valves E E at bottom. Steam is admitted at K to one of the chambers and presses out the water contained there through F to the pipe D to be carried away. Condensation then takes place, a vacuum is formed, and the ball falls over and closes the opening through which the steam entered, and water flows up through the clack-valves and again fills the chamber. The steam in the meantime is now acting upon the water in the adjoining chamber, condensation then taking place there, the ball falls back to that side, and the operations go on alternately, the result being a steady stream of water sucked into one chamber after another, and then forced out and upwards by the steam.

Pulta'wa. See *Poltava.*

Pulteney (pult'ni), William, an English politician, was born in 1684, of an old Leicestershire family; died in 1764. He entered the House of Commons in 1705, and became a privy-councilor and secretary of war at the accession of George I, being then a friend and partisan of Walpole. He later turned against Walpole and was dismissed. On Walpole's fall he was asked to form a ministry but it soon fell. He was later created Earl of Bath and retired from public life.

Pultusk (pöl-tösk'), a town of Russian Poland, on the river Narew, 32 miles N. N. E. of Warsaw. The Saxons were here defeated by Charles XII in 1703, and the Russians had to retreat before the French in 1806. Pop. 15,878.

Pulu (pö'lö), a silky, fibrous substance obtained from ferns of the genus *Cibotium*, and exported from the Sandwich Islands; used for stuffing mattresses, etc. Other species growing in the East Indies, Mexico, etc., yield a similar substance.

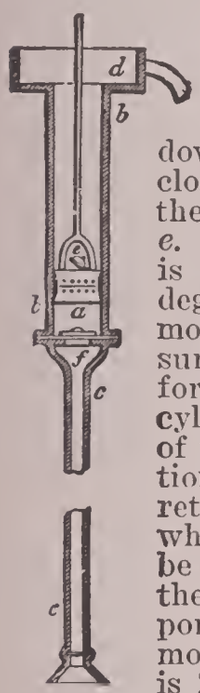
Pulza-oil (pöl'za), the oil yielded by the physic-nut (which see).

Puma (pū'ma). See *Cougar.*

Pumice (pū'mis), a substance frequently ejected from volcanoes, of various colors, gray, white, reddish brown or black; hard, rough and porous; specifically lighter than water, and resembling the slag produced in an iron furnace. Pumice is really a loose,

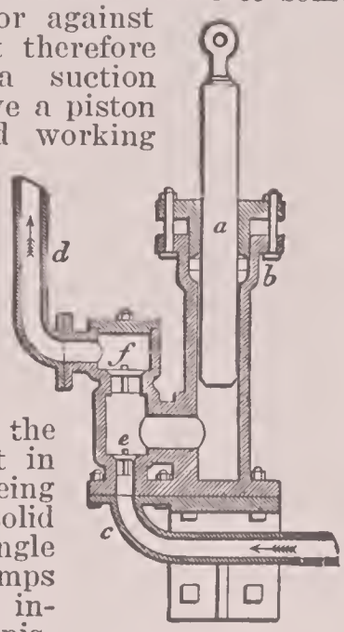
spongy, froth-like lava. It contains 75 parts silica and 17 alumina, with some iron, lime, soda, etc., and the pores being generally in parallel rows, it seems to have a fibrous structure. Pumice is of three kinds, glassy, common, and porphyritic. It is used for polishing ivory, wood, marble, metals, glass, etc.; also for smoothing the surface of skins and parchment.

Pump, a mechanical device for producing flow of fluids against resistance or pressure, either by the communication of mechanical motion or by direct application of the stored power of another fluid under pressure. (See *Air-pump, pulsometer, hydraulic ram, chain-pump.* In ordinary practice the fluid involved is water, special designs of pumps being used for other liquids. The most familiar form of pump is the suction well pump (see Fig. 1), in which a cylinder with valves opening upward, as shown, communicates with the water by an air-tight suction pipe *c*. When the piston moves upward in the cylinder, valve *f* opens and the air is partly exhausted from *c*. On the down stroke of the piston, *f* closes and the air contained in the cylinder is forced out through *e*. After a few strokes the air is exhausted from *c* to such a degree that the unbalanced atmospheric pressure acting on the surface of the water in the well forces water up *c* and into the cylinder, after which each stroke of the piston discharges an additional quantity of water. Theoretically, the distance through which the water is raised might be as great as 34 feet, which is the length of water column supported by the pressure of the atmosphere. The practical limit is 28 to 30 feet at best, since a perfect vacuum cannot be formed in the cylinder on account of slight leakage. In case the height through which the water is to be pumped is greater than this, the lift pump is used. In it the cylinder is submerged in the water to be pumped, the piston being actuated by a long rod extending to the pump handle or other driving means. The valves operate in the same manner as in the suction pump, but instead of the water being forced up the pipe by atmospheric pressure working against the vacuum produced within the cylinder, it is pushed up the discharge pipe by the motion of the piston. The latter type has the advantage of not being rendered inoperative by any small leak in the pipe connections. A small leak in the suction pipe of a suction pump prevents the formation of a vacuum and stops the action of the pump.



Suction-pump.

The force pump is usually set above its source of supply and forces water to some still higher point or against some pressure. It therefore acts partly as a suction pump. It may have a piston with a piston rod working through a stuffing box, or it may have a solid plunger, as shown in Fig. 2. In the first case the pump is double acting, that is, water is flowing into one end of the cylinder while that in the other end is being forced out. The solid plunger type is single acting. In force pumps the valves are not incorporated in the piston or plunger, but have their communication with the cylinder through ports in the sides or ends of the cylinder. Force pumps range in size from very small units for boiler feed work up to very large city-water-supply pumps driven by triple expansion steam engines and capable of delivering up to sixteen million gallons per day when pumping to a height of two hundred feet. Small high speed force pumps are employed in steam fire engines. In the pump shown in Fig. 2, the plunger, *a*, works through an air-tight stuffing-box, *b*, at the top of the pump cylinder and does not necessarily fit the body of the cylinder closely since its purpose is merely to displace a certain volume of water. Raising the plunger creates a vacuum in the cylinder. Atmospheric pressure then causes water to enter through valve *e* from suction pipe *c*. On the down stroke of the plunger, valve *e* closes and the water is forced out through discharge valve *f* and delivery pipe *d*. When it is desired to maintain a steady flow from the end of the discharge pipe an air chamber is connected into the pipe near the pump. During the discharge stroke of the pump, water rises in the chamber and compresses the entrapped air. During the suction stroke, when the velocity in the discharge pipe would otherwise become zero, this air expands and continues to drive out the water until the next discharge stroke begins. Notable improve-



Force-pump of Steam engine.

ments have been made in the design of valves for high-speed plunger pumps. Lightness for quick opening and closing, and a clear waterway to decrease resistance are the essentials. The Gutermuth hair-spring valve (Fig. 3) is a most satisfactory valve in both respects. It consists of a flat spiral spring, one end of which is held by a shaft, as shown, its free end covering the port. Its weight is about

Fig. 3. Gutermuth Hair-spring Valve.

one-tenth that of an ordinary valve designed for the same service, and its use on pumps, originally equipped with ordinary valves, increases their capacity by 200 per cent or more.

Rotary pumps, as a class, should be distinguished from centrifugal pumps, since the former are positive displacement pumps while the latter act by centrifugal force alone. Their advantages are: small size for a given capacity; have no valves to wear and cause trouble; may be run at widely varying speeds without serious loss of efficiency; may be constructed to handle very large quantities of water when pumping against low lift. Rotary pumps may be classified under four types: (1) those having an elliptical or two-part cylindrical casing, in which rotate either two piston wheels or one piston wheel and one revolving drum so meshing together as to prevent the backward flow of liquid between them, and so shaped as to trap a certain volume between themselves and the casing and carry it around from the inlet side to the discharge side at each revolution; (2) those having a rotating drum with sliding axial vanes, which move in contact with the ends of the cylindrical casing, these ends being cam-shaped so that their surfaces approach and recede from the ends of the drum at successive points around their circumference; (3) those having eccentric pistons operating pivoted vanes (see Fig. 4); (4) those provided with a revolving drum set eccentrically in a cylindrical casing and having either radially sliding vanes, or hinged vanes, or rollers, working in contact with the wall of the casing. Fig. 4 shows a pump of the third mentioned type with the end cover plate removed. The two-part cylindrical casing *K* contains, in the lower part, the cradle, *C*, which turns slightly from side to side and into which the tongue, *T*, slides. Considering the shaft *F* to rotate clock-wise, and with it the eccentric, *E*, around which the tongue *T* extends, the space on the left continually increases, admitting more water from the supply pipe, *S*, and the space on the right continually decreases, driving out the water on that side through the discharge pipe, *D*. During rotation communication between supply and discharge pipes is cut off below by tongue *T*, and above by close contact of the eccentric with the casing. When the eccentric reaches the lowest point and rests in the top of the

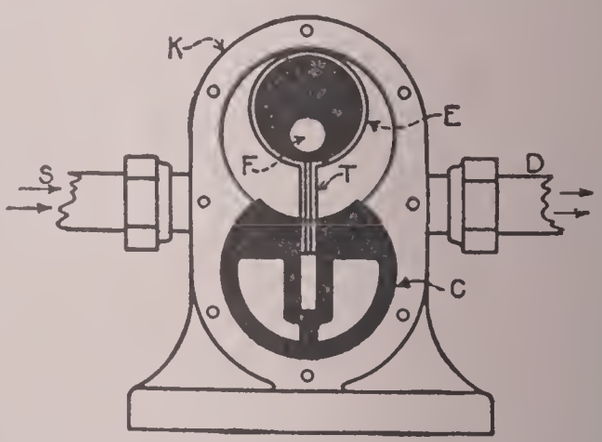


Fig. 4. Lamplough-Albany Rotary Pump.

cradle, *C*, it then covers the ports leading to suction and discharge pipes and prevents back flow through the space above it. Some very large rotary pumps of the first type mentioned are in use for irrigation, individual pumps having a capacity as great as 25,000 gallons per minute.

The efficiency of these large pumps, when lifting water against low heads (about 30 feet), is excellent, being 80 per cent or more.

In the *centrifugal pump* energy of motion, or kinetic energy, is imparted to the water by a rapidly revolving impeller wheel, through which it flows. This velocity energy is converted into pressure energy in the vortex or whirlpool chamber of the pump casing and so produces flow against resistance. Centrifugal pumps may be broadly divided into two types: volute pumps and turbine pumps. The difference lies in the design of the casing. Fig. 5 shows two sectional views at right angles of a volute pump with single suction connection. In order to operate, a centrifugal pump must have the passages of its impeller filled with water. It is ordinarily primed by pumping out the air with a small hand pump or jet-pump (q. v.) or by flooding water back through the discharge pipe from some elevated source. Assuming the passages to be filled with water, and the impeller *I* to be rotating in the direction shown by the arrows in section *A-A*, the action is as follows: water rises through the suction pipe (not shown) and enters the impeller at *S*. It passes through the impeller, as shown by the arrows, between the blades, *b*, and, due to centrifugal force, is discharged around the periphery of the impeller with considerable velocity. As it flows into the volute casing, *V*, its velocity is gradually decreased, the velocity energy being thus converted into pressure energy. Referring to section *A-A*, the water discharged from the upper right hand part of the impeller must travel entirely around the casing before reaching the discharge pipe, but at each successive point around the periphery additional water is being discharged; hence it is necessary that the size of the casing should gradually increase to accommodate the increased quantity. This uniform enlargement gives the casing the volute form from which the pump derives its name. The cross section of the volute is so varied as to give a constant velocity of flow at all points around the wheel equal to the velocity in the discharge pipe. Volute pumps are sometimes built with the casing farther from the edge of the impeller than here shown, and the water leaving the impeller flows through a flat, circular passage called a whirlpool chamber before entering the volute. The object is to more gradually reduce the velocity of discharge from the impeller and thus recover more of the velocity energy.

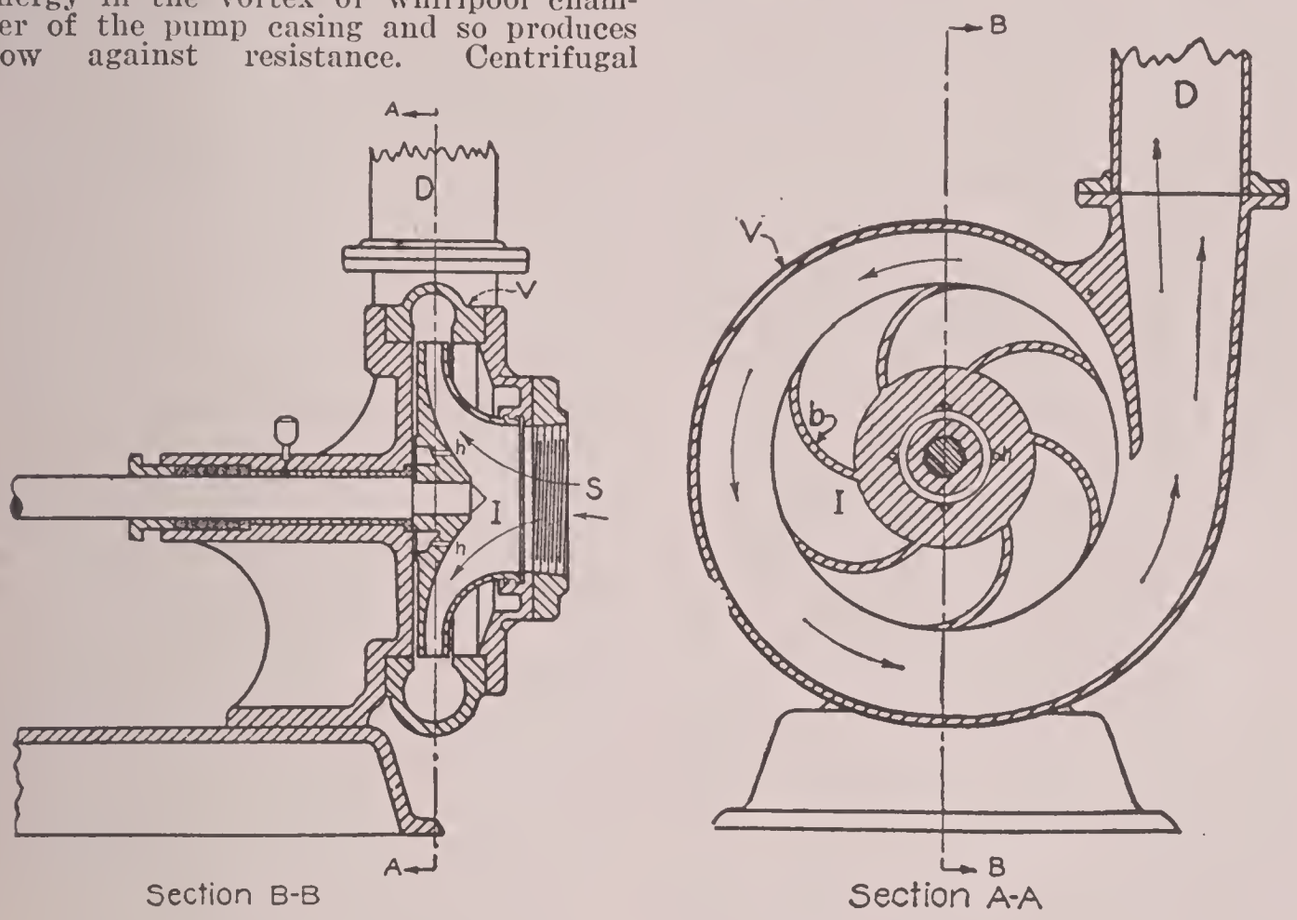


Fig. 5. Volute Centrifugal Pump.

Fig. 6 represents a section corresponding to *A-A*, through a turbine pump. The

impeller is the same, but the water when discharged is caused to pass between stationary guide vanes, *g g*, through gradually enlarging passages, where its velocity is reduced before entering the casing. This type may have a concentric casing, as shown in Fig. 6, or may have a volute casing. Either type of pump may have a

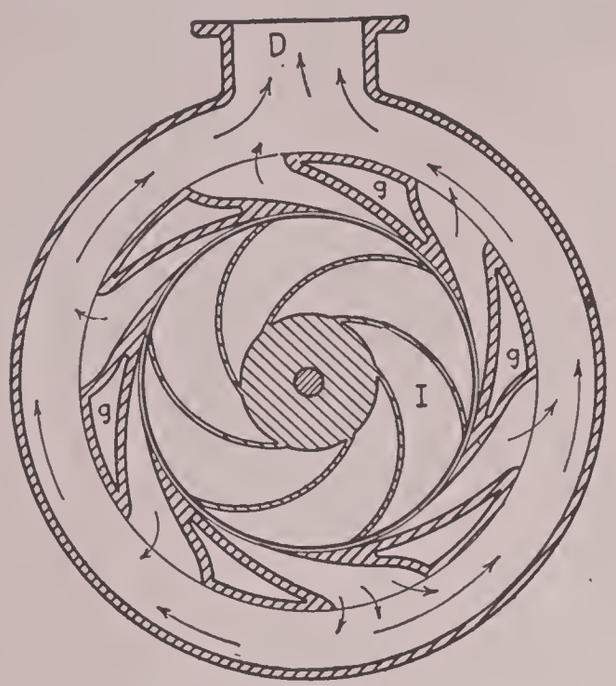


Fig. 6. Turbine Centrifugal Pump.

single suction, as shown, or the impeller may take in water on both sides and discharge at its periphery. The double suction is desirable since the water entering equally from opposite sides produces no unbalanced thrust on the shaft. In Fig. 5, water enters at *S*, parallel to the shaft, and is discharged at right angles to it. This deflection of the stream causes pressure against the impeller parallel to the shaft. Holes are drilled at *h h* through the back of the impeller to equalize the pressure on the two sides. Thrust bearings are usually provided in addition on single suction pumps. Where water is to be pumped to high elevations a pump with one impeller would have to be run at very high speed to create sufficient pressure, which is undesirable; hence for high heads multi-stage pumps are used. In these the casing is so made that the discharge from one impeller is led into the suction opening of a second mounted on the same shaft, the discharge from the second into a third, etc., each impeller adding its increment to the pressure. Pumps with six stages are not uncommon. Some with as many as twelve stages have been built. Centrifugal pumps have been improved in design so that efficiencies of 80 per cent and over have been attained. They are more desirable than reciprocating pumps because of their purely rotary motion and consequent freedom from vibration. Also they are valveless.

The *jet pump* (Fig. 7) is a device which utilizes the energy of a fluid under pressure for pumping. The fluid may be water under pressure, steam, or compressed air; *I* is the inlet for the suction pipe carrying the water to be pumped; *S* is the connection for the fluid under pressure; *D* is the discharge pipe. In operation, the fluid under pressure is projected through the nozzle *N* at a very high velocity. Since all its original pressure energy is now converted into velocity energy the pressure in the throat, *V*, of the combining tube will approach zero, that is, it becomes less than atmospheric pressure. The unbalanced pressure of the atmosphere outside forces the water to be pumped up the supply pipe, *I*, where it is drawn into the combining tube, *V*. The combined stream passes through the diverging cone, *D*, where its velocity is decreased and its velocity energy converted into pressure energy which enables it to flow against resistance. The jet pump is especially useful in ejecting bilge-water from barges, filling tanks on traction engines, pumping out excavations, or in handling water which contains much sediment, as it has no working parts to be damaged by foreign matter. It is used in a much more complicated form in injectors for feeding water into locomotive boilers.

The *air-lift pump* (Fig. 8) employs the aeration principle in elevating water. It is evident that a column of air and water

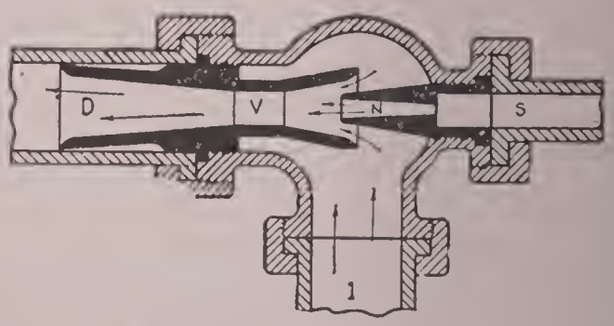


Fig. 7. Section of Jet Pump.

mixed is lighter than a column of water of equal height. Thus in the air-lift pump a column of water is made to elevate a much longer column of air and water. The arrangement of piping may be varied considerably from the arrangement shown. The air pipe may be placed inside the rising main or the two may be placed side by side, the air pipe being bent at the bottom to discharge upward into the other. In the figure, compressed air is forced

down the annular space between the air casing and the rising main. It depresses the water in that space to the level of the lower end of the rising main and rises inside the latter in large bubbles. The column of water within the well casing, measured from the surface down to the end of the rising main, is sufficient to support this column of highly aerated water within the rising main and reaching to the point of discharge above ground. The depth to which the rising main is submerged should be from 1½ to 2 times the height through which the water is to be elevated. Although this method of raising water is comparatively inefficient, it has been used largely in artesian wells because of the complete absence of moving parts within the well and because of the ease with which the plant may be set up. Theoretically it should lift water through any height. Practically high lifts are inadvisable because of the high pressure of air required. Each foot of lift requires about .65 pounds per square inch additional pressure. One cubic foot of compressed air will raise from eight to twelve gallons of water. The method, though invented in 1797 by Carl Loscher, was first extensively used about 1845 for pumping oil in the Pennsylvania oil field.

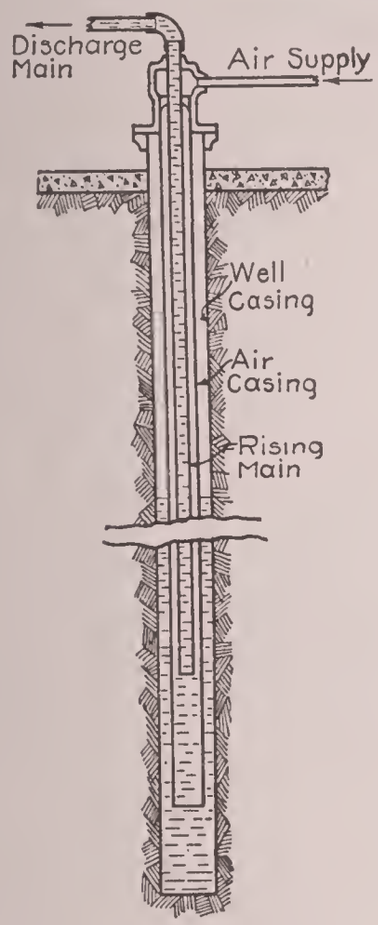


Fig. 8. Section of Air-lift Pump.

The principle of most recent development in gas displacement pumps is shown in the Humphrey pump (Fig. 9), which acts by the direct pressure of an explosive mixture working against the column of water to be elevated. Referring to the figure, *C* is the explosion chamber, the head of which is fitted with gas intake and exhaust valves similar to those of a gas engine, and an electric sparking device. The suction tank is kept full by a supply pipe fitted with a float valve which maintains a constant level. Discharge pipe *D* connects with some elevated tank or reservoir to which the water is to be pumped. Valves *V V* admit water from the supply tank, but prevent flow in the opposite direction. In starting the pump, compressed air is admitted to the top of chamber *C*, forcing the contained water some distance out the delivery pipe. The exhaust valve is then opened, allowing the air to be driven out by the weight of the water column in the delivery pipe. When the water rises nearly to the top of *C* it closes the exhaust valve by impact, and is then brought to rest by the cushion of entrapped air. This air expands and sets the water column in motion in the opposite direction, but, due to its inertia, it goes so far that the pressure in *C* is reduced below atmospheric, whereupon the inlet gas valve opens and a combustible charge is drawn in. The water column then surges back and compresses the charge, which is fired automatically by an electric spark. The pressure of combustion drives the water out forcibly and a portion is discharged into the reservoir. Again, due to its momentum, the water reduces the pressure in the pipe *D* below atmospheric and a charge of water is drawn in through valves *V V*. When the water again surges back the exhaust valve is held open and the burnt gasses expelled

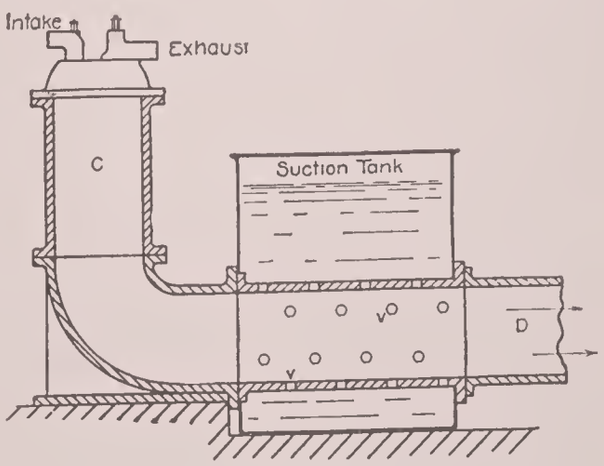
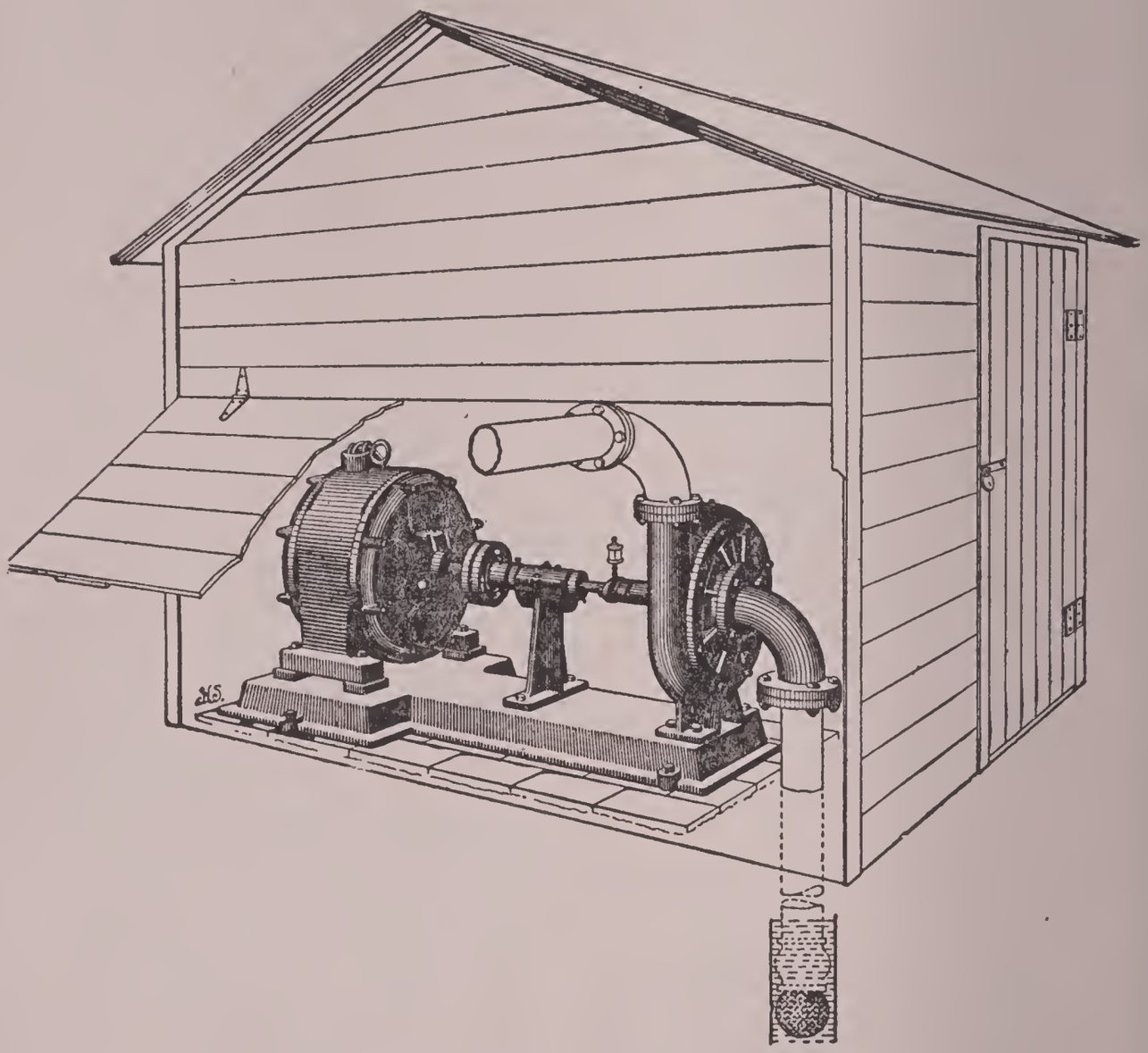


Fig. 9. Section of Humphrey Gas-displacement Pump.

until it is closed by impact of the water and the cycle is repeated. Pumps of this type show a very high efficiency. They may be adapted to work with suction lift.



Centrifugal Pump and Motor.

Pumpelly (pum'pel-i), RAPHAEL, geologist, born at Oswego, New York, in 1837. In early life he conducted explorations for the governments of China and Japan, and in 1866 became professor of mining engineering in Harvard. He was on the geological survey of Michigan 1870-71, State geologist of Missouri 1871-73, and on the United States geological survey 1879-81 and 1884-91. In 1903-04 he was engaged in explorations in Central Asia. He is the author of *Across America and Asia* and other works.

Pumpernickel (pum'pėr-nik-el), a coarse brown bread made in Westphalia from unbolted rye.

Pumpkin (pump'kin), a climbing plant and its fruit, of the genus *Cucurbita*, the *C. Pepo*, nat. order Cucurbitaceæ or Gourds. The pumpkin is originally from India, but is at present cultivated in most parts of Europe, and in America. The fruit is red, and sometimes acquires a diameter of 2 feet. There are two varieties of the plant, one with roundish, the other with oblong fruit. The fruit is eaten in a cooked state.

Pumpkin (*Cucurbita Pepo*).

Pun, a play upon words, the wit of which depends on a resemblance in sound between two words of different and perhaps contrary meanings, or on the use of the same word in different senses.

Punch (contracted from *punchinello*), the chief character in a popular comic exhibition performed by puppets, who strangles his child, beats to death Judy his wife, belabors a police-officer, etc. The puppet-show of Punch seems to have been first popular in England during the reign of Queen Anne. The hero was sometimes called Punchinello, a semi-anglicized form of the Neapolitan Pulcinello. See *Punchinello.*

Punch, a beverage introduced into England from India, where it received its name from the Hindu word *panch*, five, this being the number of its ingredients, arrack, tea, sugar, water, and lime-juice. In a common brew of the beverage its ingredients are rum, brandy, sugar, boiling water, and lemon-juice.

Punch, a tool worked by pressure or percussion, employed for making apertures, in cutting out shapes from sheets or plates of various materials, in impressing dies, etc. Punches are usually made of steel, and are variously shaped at one end for different uses. They are solid for stamping dies, etc., or for perforating holes in metallic plates, and hollow and sharp-edged for cutting out blanks, as for buttons, steel pens, jewelry, and the like.

Puncheon (pun'shun), a liquid measure of capacity containing from 84 to 120 gallons.

Punchinello (pun-shi-nel'ō), a popular Neapolitan exhibition, the origin of the English Punch, said to be derived from a humorous peasant from Sorento, who had received the nickname (about the middle of the seventeenth century) from his bringing chickens (*pulcinelle*) to market in Naples, and who, after his death, was personated in the puppet-shows of the San Carlino theater, for the amusement of the people, to whom he was well known. According to another account, it is a corruption of Puccio d'Aniello, a favorite buffoon of the Neapolitan populace.

Punctuation (pungk'tū-ā-shun), the art of employing signs by which the parts of a writing or discourse are connected or separated as the sense requires, and the elevation, depression, or suspension of the voice indicated. Punctuation serves both to render the meaning intelligible and to aid the oral delivery. Our present system of punctuation came very gradually into use after the invention of printing, the Venetian printers, the Manutii, contributing materially to its development. The principal points used in English composition are the *comma* (,), *semicolon* (;), *colon* (:), *period* or *full stop* (.), *note of interrogation* (?), *note of exclamation* or *admiration* (!), *dash* (—), and *parenthesis* ( ). The *comma* marks the smallest grammatical division in a sentence, separating the several members of a series, and the subordinate clauses from the main clause. The *semicolon* indicates a longer pause than the comma, but requires another member or members to complete the sense. The *colon* denotes a still longer pause, and may be inserted when a member of a sentence is complete in itself, but is followed by some additional illustration of the subject. The *period* indicates the end of a sentence, and is also used after contracted words, headings, titles of books, etc., and sometimes after Roman numerals. The *note of interrogation* is placed at the end of a direct interrogatory sentence. The *note of exclamation* or *admiration* is placed at the end of such words or clauses as indicate surprise or other emotion. The *dash* is employed where a sentence breaks off abruptly, and the subject is changed; where the sense is suspended, and is continued after a short interruption; after a series of clauses leading to an important conclusion; and in certain cases to indicate an ellipsis. The *parenthesis* encloses a word or phrase introduced into the body of a sentence, with which it has no grammatical connection. In modern usage the *dash* is frequently used to replace the *parenthesis.*

Pundit. (pun'dit). See *Pandit.*

Punic (pū'nik), the language of the ancient Carthaginians, an offshoot of Phœnician, and allied to Hebrew.—*Punic wars*, wars waged between Rome and Carthage, the first B.C. 264-241; the second B.C. 218-202; and the third, which ended with the destruction of Carthage, B.C. 149-147.

Punica (pū'ni-ka), a genus of plants which consists only of a single species, the pomegranate (*P. granātum*). See *Pomegranate.*

Punishment (pun'ish-ment), a penalty inflicted on a person for a crime or offense, by the authority to which the offender is subject; a penalty imposed in the enforcement or application of law. The punishments for criminal offenses now known to American and English law are death by hanging or electrocution, imprisonment with and without hard labor, solitary

confinement, detention in a reformatory school, subjection to police-supervision, and putting under recognizance. The methods of punishment differ in different states, but the general character of punishment for offenses, as now in use, does not greatly vary in civilized countries generally. In England, in cases of felony and of certain specific misdemeanors, when a previous conviction for a similar offense is proved, the sentence may include police supervision for seven years or less, to commence at the expiration of the offender's term of imprisonment. On its expiry he must notify to the police within forty-eight hours his place or any subsequent change of residence, and report himself once a month, a breach of any of these regulations rendering him liable to imprisonment for twelve months with or without hard labor. When the offender is ordered to find recognizances, personal or other, he may, in default, be imprisoned. In army punishment a commissioned officer must be tried by court-martial, which may sentence him to death, or cashier him, or place him at the very bottom of the officers of his grade. Privates may for minor offenses be ordered short imprisonments, or punishment-drill, or stoppage of leave or pay. For grave offenses they are tried by court-martial, and may be sentenced to dismissal from the service, or to imprisonment, to penal servitude, or to death. In the navy, for officers the chief additions to the punishments inflicted in the army are forfeiture of seniority for a specified time or otherwise, dismissal from the ship to which the offender belongs, and reprimand more or less severe. For men the punishments in the case of grave offenses are of the same character as in the army, flogging being practically abolished. For less serious offenses there is a system of summary punishments, including short terms of imprisonment which can be awarded by captains of ships. Within recent years the severity of punishment by imprisonment has been mitigated to some extent in the United States. Ten of the States have adopted the principle of indeterminate sentences, the time depending on the conduct of the convict. The severity of prison discipline has been reduced and recreation provided for the prisoners in some instances, and in others the convicts have been allowed to do outdoor work without guards, their word of honor being taken, and in very few instances broken.

Punjab (pun-jäb'), or PANJAB (the name means '*Five Rivers*'), a province of British India, under the administration of a lieutenant-governor, so-called because it was the region intersected by the five tributaries of the Indus, the Sutlej, the Beas, the Ravi, the Chenab, and the Jhelum. The present lieutenant-governorship of the Punjab, however, is larger than the Punjab proper, and is bounded on the west by Afghanistan and Beluchistan; on the north by Kashmir; on the east by the Northwest Provinces; and on the south by Sind and Rajputana. The area, exclusive of native states, is 97,209 square miles; the pop., according to the census of 1901, 24,754,737; inclusive of native states, the area is 133,741 square miles, and the pop. 29,179,135. It consists of thirty-two British districts and forty native tributary states. For administrative purposes it is divided into the divi sions of Delhi, Hissar, Ambala, Jalandhar, Amritsar, Lahore, Rawal Pindi, Multan, Derajat, and Peshawar. Lahore, situated near the center of the province, is the capital of the Punjab, but its principal city is Delhi, the ancient metropolis of the Mogul sovereigns of India. The extreme northern portion of the Punjab is rendered mountainous by spurs, or offsets, of the great Himalaya system; but for the most part the province consists of a series of extensive plains. These are divided into eastern and western, which may be roughly defined as lying east and west of the meridian of Lahore. The eastern plains include the most fertile and populous portion of the Punjab, with the three great cities of Delhi, Amritsar, and Lahore. Their population is largely urban; trade and manufactures flourish, and the cultivable area is generally under the plow, with the exception of the southwestern portions, where flocks and herds pasture in extensive jungles. The western plains, on the contrary, and with the exception of a comparatively narrow zone which is fertilized by irrigation, and which produces some of the finest wheat in the world, are covered by stunted bush, with short grass in dry seasons, and by saline plants which afford nourishment to great herds of camels. These, with cattle, sheep, and goats, are tended by a nomad population. The difference between the inhabitants of these two series of plains is also very marked, those in the eastern partaking of the character of the Hindu inhabitants of India, while those in the western resemble more the Mussulman peoples of the Transsuleiman country Though numerically small, the Sikh element in the population is very important. The Sikhs constituted the dominant class when the Punjab became British, and they still compose the mass of the gentry

between the five rivers. Since the mutiny the Punjab has made great progress in commerce and general industry, partly through the construction, under British rule, of irrigation canals and railways. One of the most important products of the Punjab is rock-salt. In addition to the manufactures common to the rest of India the industries of the Punjab include such special products as the silks of Multan and the shawls and carpets of Lahore. The province enjoys an extensive trade with adjacent countries, and sends its products to Delhi by railways, and by the Indus and the Indus Valley Railway to Sind and the sea. Its imports from Britain are chiefly piece-goods, cutlery, and other metal works. The Punjab has had a rather eventful history from the time of Alexander the Great downward. After being long held by rulers of Afghan or Tartar origin, the Sikhs under Runjit Singh established themselves here early in the last century. At a later date the country fell into a very distracted state; its Sikh rulers came into warlike contact with the British, and after the second Sikh war, in 1849, the country was brought under British administration.

Punjnud (punj'nud), the name given to the stream which pours into the Indus, about 70 miles above the Sind frontier, the combined waters of the five rivers, the Sutlej, the Beas, the Ravi, the Chenab, and the Jhelum.

Punkah (pung'ka), in its original sense a portable fan made from the leaf of the palmyra, but in Anglo-Indian parlance a large fixed and swinging fan formed of cloth attached to a rectangular frame suspended from the ceiling and pulled backwards and forwards by means of a cord, thus causing a current of air in the apartment.

Punnah (pun'na), a native state of India, in Bundelcund, by the British agency of which it is politically superintended, formerly very prosperous from the yield of its diamond mines. Estimated area, 2568 sq. miles; pop. about 200,000.—PUNNAH is the chief town. Pop. 14,676.

Puno (pö'nō), a town of Peru, capital of the department of the same name, on the west shore of Lake Titicaca, about 12,430 feet above sea-level. Pop. about 6000.—The department is distinguished by the extent and richness of its pastures, and was formerly famous for its silver mines. Its principal exports are the wool of the sheep, llama, alpaca, and vicuña. Area about 42 sq. miles; pop. 537,345.

Punt, an oblong, flat-bottomed boat used for fishing and shooting in shallow waters, usually propelled by a pole. Also, in football, the act of kicking the ball before it touches the ground, when dropped by the hand.

Punta Arenas (pön'ta a-rā'nus), a port and province of Costa Rica. Several steamship lines sail from the port. Pop. 5283. Pop. of province, 23,237.—A port of Chile on Magellan Strait. Pop. 13,000.

Punxsutawney (punks'su-tą'ni), a borough of Jefferson Co., Pa., 80 miles N. E. of Pittsburgh, in a bituminous coal region, with manufactures of pig iron, gray iron castings, glass, etc. The Weber Memorial School is here. Pop. (1910) 9058; (1920) 10,311.

Pupa, same as *Chrysalis* (q. v.).

Pupil. See *Eye.*

Pupin (pū'pin), MICHAEL IDVORSKY, scientist, born at Idvor, Hungary, in 1858, was graduated from Columbia University, New York, in 1883, and became adjunct professor of mechanics there in 1889. In 1901 he announced the discovery of a method of practicable ocean telephony. He wrote *Propagation of Long Electrical Waves,* and other papers.

Puppets and Puppet-shows (pup'etz), the performances of images of the human figure moved by fingers, cords, or wires, with or without dialogue. Puppets in English, French *marionettes,* Italian *fantoccini,* are of great antiquity. In early times in England puppet-shows were called *motions,* and generally represented some scriptural subject. In later times they have ranged from Punch and Judy to representations of shipwrecks and battles.

Pura'nas. See *Sanskrit.*

Purbeck (pur'bek), ISLE OF, south of Dorsetshire, England, a peninsula so separated from the mainland on the north by Poole harbor and the Frome as to be connected with it by only a very narrow isthmus. It is about 12 miles long by 7 miles broad. The prevailing rock is limestone.

Purbeck Beds, the uppermost members of the Oölite proper, or according to other writers the basis of the Wealden formation, deriving their name from the peninsula of Purbeck, where they are typically displayed. They consist of argillaceous and calcareous shales, and fresh-water limestones and marbles, and are altogether 300 feet thick. They are noted for their layers of fossil vegetable earth (dirt-

beds), enclosing roots, trunks, and branches of cycades and conifers.

Purcell (pur'sel), HENRY, an English musical composer, born in 1658; died 1695. He studied music under Dr. Blow and became organist of Westminster Abbey in 1679. His best known works include *Dido and Eneas* (1680), the music for Dryden's version of *The Tempest* (1690), the music for Dryden's *King Arthur* (1691), *The Jubilante* and the *Te Deum* (1694), and the music to *Bonduca* (1695). Purcell was equally great in church music, chamber music, and music for the theater.

Purchas (pur'chas), SAMUEL, was born in 1577, at Thaxted, in Essex, and educated at Cambridge. He took orders and became in 1604 rector of Eastwood in Essex, the duties of which office he left for some years to be discharged by a brother, while he devoted himself in London to the self-imposed task of collecting geographical, historical, and miscellaneous information. In 1613 he issued *Purchas his Pilgrimage, or Relations of the World and the Religions observed in all Ages and Places discovered from the Creation unto the Present*, etc. In 1615 he was appointed rector of St. Martin's, Ludgate Hill, London, a position favorable to the pursuit of his multifarious researches. The MS. remains of Hakluyt having come into his hands he gave to his next work, published in 1624, the title *Hakluytus Posthumus, or Purchas his Pilgrims, containing a History of the World in Sea Voyages and Land Travels by Englishmen and others*, which is valuable as containing the narratives of voyagers, explorers, and adventurers as written by themselves, the language of the previous work, the *Pilgrimage*, on the other hand being Purchas's own. The *Pilgrims* have been much utilized by subsequent compilers of voyages and travels. Purchas died in London in 1626.

Purchase (pur'chas), in law, is the act of obtaining or acquiring the title to lands and tenements by money, deed, gift, or any means except by descent. *To be worth so many years' purchase* is said of property that would bring in, in the specified time, an amount equal to the sum paid. Thus to buy an estate at *twenty years' purchase* is to buy it for a sum equivalent to the total return from it for twenty years.

Purchase, a system formerly common in Great Britain, now abolished, by which more than half the first appointments and much of the subsequent promotion of officers in the British army used to be effected. The prices of commissions were fixed as follows:—£450 for a cornetcy or ensigncy; £700 for a lieutenancy; £1800 for a captaincy; £3200 for a majority; and £4500 for a lieutenant-colonelcy, which was the highest rank that could be obtained by purchase. In theory an officer wishing to retire from the service might sell his commission for the price affixed to the rank he occupied. When a superior officer 'sold out' the next officer inferior to him might purchase promotion to the rank of the former by merely paying the difference between the prices of their respective commissions. The rank of the second might be reached in the same manner by his next inferior, and so on down to the ensign or cornet. No commission could be purchased by one officer unless another officer vacated his commission by its sale. The abolition of the purchase system took place in 1871, but the officers who were deprived of a salable interest in their commissions were compensated by giving them a sum of money, the payment of which was to be extended over twenty-five years, and which, it was estimated, would amount to £8,000,000. Promotion has since been through seniority, tempered by selection. The Regimental Exchange Act of 1875 permitted the exchange of commissions through purchase under such conditions as the crown might deem expedient for the time being. No such system was ever introduced into the United States army, in which promotion has always depended solely upon merit, real or claimed.

Pure Food Law. This law passed by Congress in 1906, is entitled 'An act for preventing the manufacture, sale or transportation of adulterated or misbranded or poisonous or deleterious foods, drugs, medicines and liquors, and for regulating traffic therein, and for other purposes.' It makes it unlawful for any person to manufacture within the District of Columbia or any Territory any article of food or drug which is adulterated or misbranded, under a penalty not to exceed $500, or one year's imprisonment, or both, at the discretion of the court, and not less than $1000, or one year's imprisonment, or both, for each subsequent offense. The act also applies to any food or drug introduced into any State from any other State, or from or to any foreign country. It does not apply to foods or drugs made and used within the limits of any State, these being left for State legislation. The act further provides that in any package containing food or drugs, the quantity of the contents must be conspicuously marked on the outside of the package in

terms of weight, measure or numerical count. By a subsequent act it was provided that after May 1, 1916, the use of the legend, 'Guaranteed under the Food and Drug Act,' was declared misleading and deceptive and the use of a serial number on food and drugs was prohibited. It was required that guarantees of compliance with the law should be given directly to dealers and should be incorporated in the invoice or bill of sale.

Purgative (pur'ga-tiv), a medicine used for the purpose of producing the evacuation of the bowels. The following is a common classification: —(1.) *Laxative* or *Mild Cathartics*, employed when the least possible irritation is desired, such as manna, sulphur, cassia, castor-oil, tamarinds, prunes, honey, ripe fruit. (2.) *Saline* or *Cooling Laxatives*, giving rise to more watery evacuations than the first group, such as Epsom salts, Glauber's salt, phosphate of soda, Seidlitz powders, etc. (3.) *Active Cathartics*, occasionally *acrid*, frequently *tonic* and *stomachic*, such as rhubarb, senna (often in the form of black draught), and aloes. (4.) *Drastic* or *violent Cathartics*, such as jalap, scammony, gamboge, croton-oil, colocynth, and elaterium, which in large doses act as irritant poisons, and are employed in smaller doses chiefly when the bowels have failed to be moved by milder purgatives. (5.) *Mercurial Purgatives*, such as calomel, blue pill, and gray powder.

Purgatory (pur'ga-to-ri), as believed in by the Roman Catholic Church, is an intermediate state after death in which the souls of the righteous expiate, through temporary suffering, sins committed in this life, and not fully atoned for before death. According to the Council of Trent, they are 'assisted by the suffrages of the faithful, but especially by the most acceptable sacrifice of the mass,' to be enabled to enjoy the happiness of heaven. Catholics claim that this belief in purgatory is upheld by the general teaching of Scripture without being specifically declared in any particular passage; they also claim that it is in harmony with the faith and practice of the early Christian ages.

Puri. See *Pooree* and *Jagannâtha.*

Purification (pūr-i-fi-kā'shun), the Jewish rite of, was mainly one through the performance of which an Israelite was readmitted to the privileges of religious communion, lost through uncleanness. The chief varieties of such uncleanness, and the methods of purification from it required, are detailed in Lev., xii, xiv, xv, and Numb., xix. The necessity of purification was extended after the captivity to a variety of cases not included in the Mosaic legislation, such as the washing of cups and pots, etc., referred to in Mark, vii, 4.

Purification of the Virgin Mary, FEAST OF THE, called also the feast of the Presentation of the Child Jesus, is a festival of the Christian church held on the 2d of February, in commemoration of the event related in Luke's gospel, chap. ii. The festival dates from very early times, and is said to have been formally instituted by Pope Gelasius in A.D. 494. See *Candlemas.*

Purim (pū'rim), a Jewish festival observed on the 14th and 15th of Adar (March), instituted to commemorate the preservation of the Jews in Persia from the destruction threatened them by the schemes of Haman (Esther, ix).

Puritans (pū'ri-tanz), a name first applied to those English Protestants who regarded the Reformation in England as incomplete, and the Anglican Church, even of Edward VI, as retaining too much of the discipline, ritual, and ceremonial of the Church of Rome. Many of them, who were driven into exile under Queen Mary, and who returned to England after the accession of Elizabeth, brought back a zealous desire to remodel the Church of England in the spirit of continental Protestantism, especially that of Geneva. In 1572 a presbytery was set up at Wandsworth in Surrey, and before many years Presbyterianism found adherents both among the clergy and the laity. Meanwhile the Brownists, the Independents of later days, whose Congregationalism was as much opposed to Presbyterianism as to Episcopacy, began to be organized and to make some progress. In doctrine these two Puritan parties differed little from each other, or from many Anglicans who remained contented with the Church of England as it was. During the later years of Elizabeth the nickname of Puritan was popularly bestowed on all in the church, or out of it, whose views of religion led them to adopt a great austerity of life and gravity of demeanor; who made constant use of Biblical phraseology in their ordinary conversation, and who treated as sinful the most of the amusements and diversions of the society around them. The drama was specially obnoxious to them, and the dramatists repaid the hatred of the extreme Puritan by ridiculing and caricaturing him on

the stage. Though the Puritans were always steadfastly loyal to Elizabeth, the legislation which she favored visited with severe penalties all Protestant nonconformity to the Established Church, and in 1592 several leading Brownists were brought to the scaffold. The hopes with which the accession of James I inspired the Puritan party in the church were grievously disappointed when their moderate demands for a reform of ritual and a slight modification of episcopal authority were rejected at the Hampton Court Conference. During his reign the prelates and many of the clergy became less Protestant, while the Puritan element in the church, and out of it, increased in intensity. Nonconformity was pursued by new penal statutes, and numbers of Puritans emigrated to New England. This emigration continued during the reign of Charles I and the ascendency of Laud. The Parliamentarians who took arms against Charles I were mainly Puritans, and the bulk of them were Presbyterians. Presbyterianism in England reached its height with the meeting of the General Assembly of Divines at Westminster. (See *Presbyterians.*) With the downfall of the Anglican system Independency again reared its head in England. The Independents now combined with their congregationalism the desire for a theological latitude, which widened the gulf between them and the Presbyterians. The army became leavened with Independency, and Oliver Cromwell its champion. With his ascendency the influence of Presbyterianism as a power in the state dwindled, and Independency became the dominant element in English Puritanism. After the restoration of Charles II and of the old Anglicanism, the Presbyterians, Independents, and Baptists were the three chief denominations into which Puritanism had split up. Since then Nonconformists or Dissenters has been the term generally used where Puritanism would formerly have been employed. The settlement of New England by Puritans brought that section of the American colonies under the dominance of Puritanism to the extent of persecution and expulsion of other sects. The Puritans long reigned supreme in New England, and especially in Massachusetts, where they displayed an intolerance equal to that of the Anglican church from the dominance of which they had escaped.

Purl, is the name now given to hot beer flavored with gin, sugar, and ginger.

Purniah (pur'nē-a), the northeastern district of the Bhágalpur division of the lieutenant-governorship of Bengal. Rice and indigo are its chief products. Area, 4956 square miles; pop. 1,874,794.— PURNIAH, the chief town, stands on the east bank of the Saurá River. It is an unhealthy place, but does a considerable trade in jute. Pop. 14,007.

Purple (pur'pl), a secondary color compounded by the union of the primaries *blue* and *red.* Of all the various kinds in use, the Tyrian dye was anciently the most celebrated. This color was produced from an animal juice found in a shellfish called *murex* by the ancients; and as it was thus obtained only in small quantities, its use was restricted to the great and wealthy. It became the distinctive color of imperialism, and the later emperors of the East forbade its use by subjects. Hence their offspring were called *porphyrogeniti,* born in the purple. In modern times, and from the red or scarlet hat, cassock, and stockings worn by them, cardinals are sometimes said to have obtained the purple. With the general disuse of the purple obtained from shellfish, archil and cudbear, yielded by various species of lichens, were employed in the dyeing of silk and wool; but they have been superseded by the purples obtained from aniline. For cotton the chief purple dye was furnished by madder, but the alizarin to which madder owed its dyeing properties is now prepared from coal-tar. The common shades of purple with which wool is dyed are obtained from logwood with a mordant of alum and tartar.

Purple-black, a preparation of madder used as a pigment.

Purple Emperor, the *Apatura* or *Nymphalis Iris,* a large, somewhat rare, and richly-colored British butterfly; so called from the splendid purple, iridescent color of its fore-wings.

Purple Grackle. See *Crow-blackbird.*

Purple of Cassius. See *Cassius, Purple of.*

Purples, EAR COCKLE, or PEPPERCORN, a disease affecting the ears of wheat, produced by the *Tylenchus* or *Vibrio tritici* ('wheat eel'), one of the Infusoria. The infected grains of wheat at first assume a dark-green color, which soon deepens to a black, and become rounded like small peppercorns. The husks open, and the diseased grains are found to contain no flour, but a moist substance of white color and of cottony consistence. A single grain of wheat may contain 50,000 young vibrios. These forms may be dried, and

restored again on the application of moisture. Dilute sulphuric acid, in the proportion of 1 of acid to 100 parts of water, destroys the vibrio effectually.

Purples, THE, or PURPURA, spots of a livid red on the body, the result of extravasation of blood from the skin. In ordinary purpura, which is not dangerous, tonics, especially quinine and iron, are the most effective remedies. In the *purpura hæmorrhagica*, or bleeding purpura, there is hemorrhage from mucous membranes, sometimes terminating fatally. In this form of the disease with copious bleeding, benefit may be derived from the use of ergot, given either by the mouth or hypodermically, as a solution of ergotine.

Purple-wood, the heart-wood of *Copaifĕra pubiflōra* and *C. bractcāta*, imported from the Brazils, well adapted for mortar-beds and gun-carriages, and also used for ramrods, buhl-work, marquetry and turnery.

Purpura (pur'pū-ra), a genus of gasteropod molluscs, of which the greater number are littoral. Many of these molluscs secrete a fluid which is of a purplish color, but one in particular furnished that celebrated and costly dye of antiquity called the Tyrian purple.

Pur'pura. See *Purples*.

Purqueira Oil, same as *Pulza Oil*.

Purse-crab, a name for decapod crustaceans of the genus *Birgus*, allied to the hermit-crabs. A species, *B. latro* (the robber-crab), found in the Mauritius and the more eastern islands of the Indian Ocean, is one of the largest crustaceans, being sometimes 2 to 3 feet in length. It resides on land, while paying a nightly visit to the sea, often burrowing under the roots of trees, lining its hole with the fibers of the cocoanut husk and living on the nuts, which (according to some writers) it climbs the trees to procure, and the shells of which it certainly breaks with great ingenuity.

Purser (pur'sėr), in the navy, the officer who kept the accounts of the ship to which he belonged, and had charge of the provisions, clothing, pay, etc. He is now designated *paymaster*.

Purslane (purs'lān), a plant of the genus *Portulăca* (*P. oleracea*), with fleshy, succulent leaves, naturalized throughout the warmer parts of the world. Purslane was formerly more used than at present in salads as a pot-herb, in pickles, and for garnishing. It has antiscorbutic properties.

Pursuivant (pur'swi-vant), an attendant on the heralds, one of the third and lowest order of heraldic officers. There are four pursuivants belonging to the English College of Arms, *Rouge Croix*, *Blue Mantle*, *Rouge Dragon* and *Portcullis*. In the court of the Lyon King-of-Arms in Scotland there were formerly six pursuivants, *Unicorn*, *Carrick*, *Bute*, *Kintyre*, *Ormond* and *Dingwall*, but the last three have been abolished.

Puru (pö'rö), or PURUS, a river of South America, which rising in the east of Peru enters Brazil, and flowing northeast after a course of 400 miles joins the Amazon about 100 miles above the confluence of the Madeira with the latter.

Purveyance (pur-vā'ans), formerly in England the exercise by officials called *purveyors* of the royal prerogatives, involving a right of preëmption, by which the king was authorized to buy provisions and necessaries for the use of his household at an appraised value, in preference to all his subjects, and even without the consent of the owner; it included the right of impressing horses and carriages, etc., for the use of the sovereign. It was also practiced by many of the great English nobles. It led to much oppression and many exactions, and a number of statutes were passed to prevent them. There was until recently a class of purveyors in the British army, who superintended the army hospitals. Their duty is now exercised by the army service corps.

Purwa (pör'wä), a town of India, Unao district, Oude province, with manufactures of shoes and leather-work. Pop. about 11,000.

Pus, the white or yellowish matter found in abscesses, and formed upon the surfaces of what are sometimes misnamed healthy sores. It consists of dead and dying white blood corpuscles infected with pyogenic germs and tissue cells and with dissolved tissue and blood serum.

Pusey (pū'si), EDWARD BOUVERIE, after whom the Tractarian movement in the Church of England became designated Puseyism, was born in 1800. He was educated at Eton and Christ Church, Oxford, of which he became a fellow in 1824. In 1828 he was appointed to the regius professorship of Hebrew at Oxford, to which was attached a canonry of Christ Church. In 1833 the *Tracts for the Times* began to appear, but he was not prominently

connected with the Tractarian movement until 1835-36, when he contributed to the *Tracts* one on baptism which excited much attention. He published a defense of the famous *Tract No. 90*, and in 1843 he was suspended by the vice-chancellor of Oxford from preaching for three years, on account of the very high sacramental doctrine inculcated in his sermon on the Eucharist, preached before the university. The prominence thus given to him, his position in the university, his reputation for scholarship, and his thoroughgoing advocacy of 'Anglo-Catholic' principles, procured the general adoption of the term Puseyism as a

Rev. Dr. Pusey.

synonym of Tractarianism; and with the secession of Newman to Rome, Pusey became the acknowledged head of the new church party. During the rest of his life he lived very retired, though a continual flow of books, pamphlets, etc., came from his pen. He died in 1882. Among the more substantial of his works, in addition to his *Library of English Fathers* and *Anglo-Catholic Library*, are his *Councils of the Church*, from the Council of Jerusalem, A.D. 51, to the Council of Constantinople, A.D. 381 (1857); *Daniel the Prophet*, nine lectures (1864); and the *Minor Prophets*, with a commentary and introduction to the several books (1860-77).

Puseyism. See *Tractarianism*.

Pushkar (push'kar), a town of India, in Ajmere-Merwára, Rajputána, the only one in India containing a temple dedicated to Brahma. A great fair in October and November is attended by about 100,000 pilgrims. Pop. 3750.

Pushkin (push'kin), ALEXANDER, Count of Sergejevitch, a Russian poet, born at St. Petersburg in 1799; died in 1837. At an early age he was, on account of his liberal opinions, sent to Odessa, where he discharged various offices, but was restored to favor on the accession of Nicholas in 1825, who appointed him imperial historiographer. He made a study of foreign literatures, and was much influenced by Byron. His first poem was *Ruslan and Liudmila* (1821); this was followed by the *Prisoner of the Caucasus;* the *Fountain of Bakhtchisarai; Eugene Onegin;* the *Gypsies;* and *Poltava*. He was also the author of a dramatic poem, *Boris Godoonof*. He fell in a duel with his brother-in-law. His works have been translated into German, French and English.

Pushtu (push'tö; of which PUKHTU is a dialectic variation) is the vernacular language of the Afghans proper wherever they may be settled, and by the best authorities is regarded as an Aryan language, more or less allied to the Iranian group. Persian is the language of the educated classes in Afghanistan, and is also known to the people, who, however, prefer the use of Pushtu.

Pustule (pus'tūl), a small and nearly rounded elevation of the cuticle, with an inflamed base, and containing pus. Diseases known as 'pustular diseases' are those that are characterized by true pustules. Smallpox and chicken-pox are accompanied by pustules, but these are regarded as febrile, not pustular diseases, the eruption being not primary but secondary.

Putchock, PUCHUCK (puch'uk), the root of *Aplotaxis Lappa*, a composite plant growing on the Himalayas in the vicinity of Cashmere. It is exported to the Malay countries and to China, where it forms a main ingredient in the Chinese pastille-rods known as *joss-sticks*. In Upper India it is given as a medicine in various complaints ranging from coughs to cholera.

Puteaux (pû-tō), a town of France, in the department of the Seine, on the left bank of the Seine. Pop. (1906) 28,718.

Putnam (put'nam), ISRAEL, soldier, was born in Salem, Massachusetts, in 1718, and took an active part as an officer in the French and Indian war, in which he displayed the greatest hardihood and courage. At the outbreak of the Revolution he left his farm and hastened to Boston, where he became active in the siege, commanding at the battle of Bunker Hill. He

was energetic throughout the war and was appointed by Congress one of the four major-generals under Washington. He died in 1790.

Putnam, a town and city, county seat of Windham Co., Conn., on the Quinnebaug River, 33 miles N. N. E. of Norwich. It has manufactures of cotton, woolen and silk goods, shoes, cutlery, trunks, boxes, steam heaters, phonograph needles, etc. Pop. 8397.

Putney (put'ni), a suburb of London, in Surrey, on the right bank of the Thames. It is the birthplace of Gibbon, the historian, and here the Oxford-Cambridge boat races are rowed. Pop. (1911) 28,246.

Putrefaction (pū-tri-fak'shun), such a decomposition of dead organic matter as is generally accompanied by the evolution of fetid gases, now regarded as due to the agency of bacteria or other organisms floating in the atmosphere, which find a nidus in the putrescible matter and grow and multiply in it. The substances in which these micro-organisms are thus developed are reduced either to much more simple compounds or to their original separate elements. The putrefaction, or putrefactive fermentation, of animal substances is usually attended by more fetid and noxious exhalations than those arising from vegetable products, chiefly through the more abundant presence of nitrogen in the former. The formation of ammonia, or of ammoniacal compounds, is a characteristic of most cases of animal putrefaction, while other combinations of hydrogen are also formed, especially carburetted hydrogen, together with complicated and often highly poisonous vapors or gases, in which sulphur and phosphorus are frequently present. These putrefactive effluvia are, for the most part, easily decomposed or rendered innocuous by the agency of chlorine. The rapidity of putrefaction and the nature of its products are to a great extent influenced by temperature, moisture, and access to air. A temperature between 60° and 80°, a due degree of humidity, and free access of air are the circumstances under which it proceeds most rapidly. Hence the action of the minute organisms which produce putrefaction can be checked or altogether prevented by a very high, or a very low, temperature, by the exclusion of air, and by the absence of moisture. Antiseptics prevent and to some extent arrest the progress of putrefaction by killing the germs. Boiling destroys most of them. True disinfectants prevent putrefaction, destroy the germs, and dissipate the noxious products.

Puttea'la. See *Patiala.*

Puttenham (put'ten-am), GEORGE, an English writer, regarded as the author of *The Art of Poesie,* which appeared anonymously in 1589. If its author, he was, from indications given in that and another work from the same pen, born about 1530, and became a scholar of Oxford. In 1579 he presented his *Partheniades* to Queen Elizabeth, to whom he was a gentleman-usher. The *Art* is a review of ancient as well as modern poetry, and was written for the court and to instruct in versification. Its author wrote several other pieces which have been lost.

Putty (put'i), a kind of paste or cement compounded of whiting or soft carbonate of lime and linseed-oil, beaten or kneaded to the consistence of dough. In this state it is used by glaziers for fixing in the squares of glass in window frames, etc., and also by house-painters to stop up holes and cavities in woodwork before painting.

Putty-powder, a pulverized oxide of tin sometimes mixed with oxide of lead. It is extensively used for polishing and other purposes in glass and marble works; the best kinds are used for polishing plate.

Puy (pů-ē), LE, called also LE PUY-EN-VELAY, and LE PUY-NÔTRE-DAME, a town of France, chief town of the department of Haute-Loire, 270 miles S. S. E. of Paris. It is built on the steep slope of a craggy hill, crowned by a colossal statue of Notre Dame de France. It has a cathedral. Lace making is carried on. Pop. 20,940.

Puyallup (pū-al'up), a city of Pierce Co., Washington, 9 miles S. E. of Tacoma, in a berry and general farm region. It has lumber and woodworking factories, canneries, etc. Pop. (1920) 6323.

Puy-de-Dôme (pů-ē-dė-dōm), a department of Central France; area, 3070 square miles; takes its name from a volcanic cone (4805 feet) which overlooks it. The highest point in the department, Puy-de-Sancy, 6188 feet, is the most elevated peak of Central France. The department, with its numerous extinct volcanoes and volcanic formations, is geologically very interesting, the volcanic formations giving the scenery a very distinctive character. Of a total area of 3073 sq. miles, much the largest proportion is good arable and pasture land, the fertile plains of Limagne, more than 70 miles in length, consisting of alluvial deposits of volcanic

origin, making it one of the richest regions of France. There are coal and other mines in the department, which also contains a number of springs, some of which have been resorted to by health-seekers since the days of the Romans. The industries of the department include papermaking, sugar production, and the manufacture of various textile fabrics. Pop. (1906) 535,419.

Pu-Yi (HSUANTUNG), Emperor of China. He was born February 11, 1906, and acceded in 1908, in his third year, on the death of the emperor Kwang Hgsu. His father, Prince Chun, acts as regent.

Puzzola'na. See *Pozzolana* and *Cements.*

Pwllheli (pül-hā'lē), a parliamentary and municipal borough and seaport of Wales, in Carnarvonshire, on Cardigan Bay, 21 miles S. W. of Carnarvon. It is an old town, is surrounded by splendid scenery, is much visited by tourists, and has become a favorite watering place. It belongs to the Carnarvon district of parliamentary boroughs. Pop. (1911) 3791.

Pyæmia (pī-ē'mi-a), a form of blood-poisoning, a dangerous disease resulting from the introduction of decaying tissue, forming pus (which see), into the blood circulation. Such matter may be introduced through an ulcer, wound, an imperfectly closed vein, or a mucous membrane, as that of the nose. This disease was common after severe operations in crowded hospitals, whose atmosphere was loaded with purulent or contaminated matter. It has been much checked of late years by the improved ventilation of hospitals, and by the application of antiseptics in the performance of surgical operations and the dressing of wounds.

Pycnogonum (pik-nog'o-num), a genus of Arachnida, the sea-spiders. Some species are parasitic upon fishes and other marine animals, but the common species, *P. littorāle*, is free when adult, and does not appear to be parasitic during any period of its existence. *P. Balœnārum* attaches itself parasitically to the whale.

Pye (pī), HENRY JAMES, a poet laureate of England, was born in 1745, of an old Berkshire family. In 1784 he entered parliament as member for Bucks. Having in 1775 published a translation of six odes of Pindar, in 1778 one of Frederick the Great's *Art of War*, and in 1786 another of the *Poetics* of Aristotle, with a commentary, he was, in 1790, appointed poet laureate. In 1792 he was appointed a Westminster police magistrate. In 1801 appeared his *Alfred*, an epic. He died in 1813.

Pye, JOHN, an English engraver, born in 1782; died in 1874. Early in the century he gained a high reputation for his engravings of Turner's landscapes, a number of which he executed, beginning with *Pope's Villa* in 1811. He also engraved works by Claude, Michael Angelo, Gasper Poussin, Landseer, etc. He passed much of his life in Paris, and was elected a corresponding member of the French Institute.

Pygmalion (pīg'mā-li-on), in Greek mythology, a king of Cyprus, who, having made an ivory image of a maiden fell in love with his own work, and entreated Venus to endow it with life. His prayer was granted, and the maiden became his wife.

Pygmy (pig'mi), one of a race of dwarfs, first mentioned by Homer as dwelling on the shores of Ocean, and having to sustain a war against the cranes every spring. Later writers place them mainly in Africa, and Aristotle at the sources of the Nile. Recent travelers have found tribes of dwarfs in many parts of Africa, in the Andaman and Philippine Islands (See *Negritos*), and also related tribes elsewhere in that region. A tribe of Pygmies has recently been discovered in New Guinea, averaging 4 feet, 3 inches in height and extremely wild. In addition a dwarf race has been reported in New Britain, who dwell in rock clefts and steal fruit. There are also very short people in the Bismarck Archipelago, the Solomon Islands, and the Malay peninsula, but these indicate a race mixture. The Bushmen of South Africa are a small people, but not dwarfish. See *Akkas.*

Pylades (pī'la-dēz), in Greek mythology, son of Strophius, king of Phocis, and Anaxibia, the sister of Agamemnon, after whose murder by Clytemnestra, their son Orestes, being carried secretly to the court of Strophius, formed the friendship with Pylades which has become proverbial. He assisted Orestes in murdering Clytemnestra, and eventually married his sister Electra.

Pyle (pīl), HOWARD, American artist and writer, born at Wilmington, Delaware, in 1853; died in 1911. His brilliant work as an illustrator made him one of the foremost of American artists.

Pylon (pī'lon), in Egyptian architecture, the name given to towers or masses of masonry, somewhat resembling truncated pyramids, placed one on each side at the entrance of temples, and having a very imposing appearance

Behind them in the larger temples there was often a large open court, and in front there might be an avenue with sphinxes on either side. An entrance of which these pylons form part is sometimes called a *propylon*. See *Egypt* (*Architecture*).

Pylorus (pī-lō′rus), the lower and right orifice of the stomach through which the food passes on to the intestine. See *Stomach*.

Pylos (pī′los), a town of ancient Greece, memorable in the Peloponnesian war, and represented by the modern Navarino.

Pym (pim), JOHN, an English statesman and leader of the popular party during the reigns of James I and Charles I, was born in Somersetshire in 1584; studied at Oxford and became famous as a lawyer. He entered Parliament in 1614, and during the reign of James he attained great influence by his opposition to the arbitrary measures of the king. He was a zealous Puritan. In 1626 he took part in the impeachment of

John Pym.

Buckingham and was imprisoned. In the Short Parliament of 1640 Pym and Hampden were exceedingly active as leaders of the popular party, and in 1641 Pym was offered the chancellorship of the exchequer. He impeached Strafford, and at his trial appeared as accuser. He was the main author of the *Grand Remonstrance*, the final appeal presented in 1641, and one of the five members to arrest whom the king went to the House of Commons in January, 1642. When civil war became inevitable Pym was appointed one of the committee of safety, and while he lived was active in resisting the negotiation of any peace with the king which did not secure the liberties of the subject and the supremacy of parliament. It was mainly his financial skill that enabled the parliamentary army to keep the field. In Nov., 1643, he was made lieutenant-general of ordnance, and in the following month he died, and was buried in Westminster Abbey.

Pymma-wood, the wood of the *Lagerstræmia regīnæ*. See *Bloodwood*.

Pyramid (pir′a-mid), in geometry, is strictly a solid contained by a plane triangular, square, or polygonal base, and other planes meeting in a point. This point is called the vertex of the pyramid; and the planes which meet in the vertex are called the sides, which are necessarily all triangles, having for their bases the sides of the base of the pyramid. Every pyramid is one-third the solid content of a prism that has the same base and altitude as the pyramid. Pyramids are denominated triangular, square, pentagonal, etc., according as the base is a triangle, a square, a pentagon, etc.

Pyramid, in architecture, a colossal structure of masonry having a rectangular base and four triangular sides terminating in a point, used by the ancients in various parts of the world for sepulchers or for religious purposes, especially in Egypt. The largest and most remarkable of the Egyptian pyramids occur in several groups on the west side of the Nile, on the border of the Libyan desert, extending for a distance of about 25 miles from north to south, the farthest north being opposite Cairo. They are built chiefly of the hard limestone of the adjacent hills, but large blocks of granite brought from a distance are also used, especially on the outside. The four sides are so placed as to face the four cardinal points. Some of these structures belong to a very ancient date in the empire. The stones used varied in size, but are mostly large, and have required great mechanical skill to quarry them, transport them, and raise and adjust them in their proper places. An almost incredible number of laborers were engaged in erecting the chief Egyptian pyramids, of which the group of Gizeh, 4 miles S. W. of Cairo, in the neighborhood of the ancient Memphis, is the most remarkable. This group consists of nine pyramids, among them the three most celebrated of all, the pyramid of Cheops (Khufu), called the Great Pyramid; of Cephren (Khafra); and of Mycerinus (Menkauru). According to Herodotus, the Great Pyramid took 100,000 men

working for ten years to make a causeway 3000 feet long in order to facilitate the transport of the stone from the quarries; and the same number of men for twenty years more to complete the pyramid itself. Its base forms a square, each side of which was originally 768 feet, though now, by the removal of the coating, only 750 feet long, occupying 13 acres. The outer surface forms a series of steps, each of the average height of 3 feet or more. When the structure was perfect this step formation was hidden by the coating, which rendered the sides quite smooth, and the apex, where there is now a space of 12 sq. yards, was no doubt originally quite sharp. The height was originally about 480 feet, but is now only 451. The interior, entered 49 feet above the base of the north face, contains several chambers, one of which, called the King's Chamber, is 34¼ feet long, 17 wide, and 19 high, and contains a sarcophagus of red granite. The second pyramid is 690 feet square and 447 feet high. The third pyramid is only 354 feet square and 203 feet high, and is the best constructed of the three. The six smaller pyramids which complete the Gizeh group are of much inferior interest. The pyramids are supposed to have been built by the respective kings as tombs and memorials of themselves; and it is conjectured that they were begun at the beginning of each reign, and that their size corresponded with the length of it. About 350 yards southwest of the Great Pyramid is the celebrated Sphinx. Ruins of pyramids are to be found at Benares in India and in other parts of the East. Certain monuments of the ancient inhabitants, found in Mexico, are also called pyramids. These seem to have been intended to serve as temples, the tops of them being flat and surmounted by a house or chamber in which sacred rites were probably performed. The largest and perhaps the oldest of them is that of Cholula, which is said to have a base of 1770 feet and a height of 177 feet.

Pyr'amus and This'be, a pair of devoted lovers, who, as their story is told by Ovid (Met., iv, 55-165), resided in Babylon, and being prevented by their parents from meeting openly, were in the habit of secretly conversing through an opening of the wall, as their houses adjoined. They agreed one day to meet at the tomb of Ninus, when Thisbe, who was the first at the rendezvous, was surprised by a lioness and took to flight. In her haste she dropped her garment, which the lioness seizing, covered with blood, having immediately before killed an ox. Pyramus appearing on the scene, and concluding from the blood-besmeared robe that Thisbe was dead, killed himself. Thisbe returning soon afterwards, and finding the body of her lover, also killed herself. The story was very popular in the time of Shakespeare, who made it the subject of the burlesque interlude in *A Midsummer Night's Dream.*

Pyrenees (pir'ē-nēz), a lofty mountain range, the crest of the main chain of which forms the boundary between France and Spain. It abuts with one extremity on the Mediterranean, and with the other on the Atlantic. Its length, from Cape Creux on the Gulf of Lyons to Fontarabia on the Bay of Biscay, is about 280 miles, and its greatest breadth little more than 50 miles. It consists of two lines, which form parallel ridges about 20 miles from each other, except near the center, towards which the range rises both from the east and west. The descent on the south side is much more abrupt than on the north. Its loftiest summits are near its center, where its culminating point, Maladetta, or Pic de Néthou, reaches a height of 11,424 feet. The principal passes in the Pyrenees, formed by the meeting of valleys from opposite sides of the axis, take in the east part of the chain the name of Cols, and towards the center that of Ports. Only four of these are conveniently practicable for carriages. Two great railway tunnels, completed in 1913, will do much to shorten the journey and to promote traffic between France and Spain. In the Pyrenees is to be found some of the finest scenery in France. The climate, genial and warm, banishes perpetual snow to 1300 feet higher than the snow-line of the Alps. The French Pyrenees abound in mineral springs, in connection with which are some of the gayest watering places in Europe, chief among them Bagnères de Luchon. Barège is in a dreary gorge, but its waters are celebrated for their efficacy.

Pyrénées (pē-rā-nā), the French name of the Pyrenees, giving name to three French departments. — BASSES-PYRÉNÉES (bäs-pē-rā-nā) is a department of Southwestern France, at the angle of the Bay of Biscay. Its industry is mainly agricultural. The surface is diversified, there is much fine scenery, and the forests are extensive and valuable. Biarritz, its chief watering place, is well known as a health resort, especially in winter. Pau is the capital of the department. Area, 2943 sq. miles;

pop. 426,347.— HAUTES-PYRÉNÉES (ōt-pē-rā-nā) is a department of Southern France, bounded partly by Spain, partly by Basses-Pyrénées, and other departments. To it in the south belong some of the loftiest summits of the Pyrenees. The fine scenery and the mineral springs of the department attract many visitors. Area, 1749 square miles; pop. 212,173. Tarbes is the capital.— PYRÉNÉES-ORIENTALES (pē-rā-nā-zo-rē-aṇ-tàl), a department of Southern France, bordering on the Mediterranean and the Spanish frontier. Its chief wealth lies in its wines, of which the well-known Roussillon is one. The department is also very rich in iron. Perpignan is the capital. Area, 1592 square miles; pop. 212,121.

Pyrenees, PEACE OF THE, concluded between France and Spain by Cardinal Mazarin and De Haro, on the Ile des Faisans, in the river Bidassoa, on the borders of the two countries, November 7, 1659, terminated a war which had lasted for twenty-four years. By this treaty Spain ceded to France Roussillon, with the fortress of Perpignan, etc., so that the Pyrenees have since formed the boundary of the two kingdoms; and in the Netherlands, Artois, and part of Flanders, Hainault, and Luxemburg, with a number of fortified towns.

Pyrethrum (pi-reth'rum), a genus of herbaceous plants nearly allied to *Chrysanthemum*. *P. Parthenium* is known as feverfew; from *P. roseum* is made the well-known Persian insect-powder.

Pyrgos (pir'gōs), a town of Greece, near the west coast of the Morea, and not far from the mouth of the Ruphia (Alpheios). Its harbor is at Katakolo, to which there is a railway, and it carries on a considerable trade. Pop. (1907) 13,690.

Pyrheliometer (per-hē-li-om'e-ter), an instrument devised by M. Pouillet for measuring the intensity of the heat of the sun. It consists of a shallow cylindrical vessel of thin silver or copper, containing water or mercury in which a thermometer is plunged. The upper surface of the vessel is covered with lampblack, so as to make it absorb as much heat as possible, and the vessel is attached to a support in such a way that the upper surface can be always made to receive the rays of the sun perpendicularly. The actual amount of heat absorbed by the instrument is calculated by ordinary calorimetrical means. The area of the exposed blackened surface and the amount of water or mercury which has been raised through a certain number of thermometric degrees being both of them known, the absolute heating effect of the sun, acting upon a given area under the conditions of the experiment, can be readily found.

Pyrites (pi-rī'tēz), a name given in mineralogy to various metallic sulphides, chiefly to the sulphides of copper and iron. Pyrites is largely used as a source of sulphur in the manufacture of sulphuric acid. It is a widely diffused and plentiful mineral, occurring in many different kinds of rocks. It is abundant in many coal seams, and is apt to become so heated by the action of water and air, which change it into sulphate of iron, as to set fire to the coal. Copper pyrites, called also yellow copper and chalcopyrite, is the most abundant of all the ores of copper, and yields a considerable portion of the world's copper. The color of pyrites has often caused it to be mistaken for gold, of which there is a notable instance in the early history of Virginia. For iron pyrites see *Iron*.

Pyritz (pē'ritz), an ancient town of Prussia, 24 miles southeast of Stettin. Its chief industries are machinery, sugar manufacture, and agriculture. Pop. (1905) 8600.

Pyrmont (pir'mont), a watering place of Prussia, in the principality of Waldeck and Pyrmont (which see), 34 miles s. s. w. of Hanover. Small but well built, with several fine promenades, it contains a palace, and a very complete bathing establishment. The water is chalybeate, possessing valuable medicinal properties. Over 100,000 bottles of water are annually exported. Pop. 1500.

Pyro-electricity (pī'rō), a name given to electricity produced by heat, as when tourmaline becomes electric by being heated between 10° and 100° Centigrade.

Pyrogallic Acid (pī-rō-gal'ik; $C_6H_6O_3$), an acid obtained by the dry distillation of gallic acid (which see). It forms crystals that have neither smell nor color, is readily soluble in water, alcohol and ether, has a neutral reaction, readily absorbs oxygen in an alkaline solution, and becomes of a dark brown color. It is used in photography, and sometimes as a hair-dye.

Pyr'ola. See *Wintergreen*.

Pyroligneous Acid (pī-ru-lig'ne-us), an impure acetic acid obtained by the distillation of wood.

Pyrolusite (pī-ru-lū'sīt), a black ore of manganese, occurring crystallized and massive in Devonshire,

Warwickshire, Thuringia, Brazil and other places. It is the binoxide, dioxide, or peroxide of manganese, and is much used in chemical processes.

Pyrometer (pī-rom′e-ter), any instrument, the object of which is to measure all gradations of temperature above those indicated by the mercurial thermometer. Wedgwood's pyrometer, the first which came into extensive use, was used by him for testing the heat of his pottery and porcelain kilns, and depended on the property of clay to contract on exposure to heat. Many different modes have been proposed or actually employed for measuring high temperatures; as by contraction, as in Wedgwood's; by the expansion of bars of different metals; by change of pressure in confined gases; by the amount of heat imparted to a cold mass; by the fusing point of solids; by color, as red and white heat, etc.

Pyrope (pī′rōp), fire-garnet or Bohemian garnet, a dark-red variety of garnet, found embedded in trap tufa in the mountains of Bohemia. It occurs also in Saxony in serpentine.

Pyrophone (pī′ru-fōn), a musical instrument, in which the various notes are produced by the burning of hydrogen gas within glass tubes of various sizes and lengths.

Pyroscope (pī′ru-skōp), an instrument for measuring the intensity of heat radiating from a hot body or the frigorific influence of a cold body.

Pyrosis (pī-rō′sis), in medicine, a disease of the stomach attended with a sensation of burning in the epigastrium, accompanied with an eructation of watery fluid, usually insipid, but sometimes acrid. It is commonly called *Waterbrash.*

Pyrosoma (pī-ru-sō′ma), a genus of phosphorescent Molluscoida, of the group Tunicata, compound ascidians inhabiting the Mediterranean and Atlantic. They unite in great numbers, forming a large hollow cylinder, open at one end and closed at the other, swimming in the ocean by the alternate contraction and dilatation of its component individual animals.

Pyrotechny (pī-ru-tek′ni), the science of making and using artificial fireworks, the chief ingredients of which are niter, sulphur, and charcoal. Iron filings yield bright red and white sparks. Steel filings and cast-iron borings contain carbon, and give a more brilliant fire with wavy radiations. Copper filings give flame a greenish tint, those of zinc a fine blue color; the sulphuret of antimony gives a less greenish blue than zinc, but with much smoke; amber, resin, and common salt give a yellow fire. Lampblack produces a very red color with gunpowder, and a pink with niter in excess. Verdigris imparts a pale green, sulphate of copper and sal ammoniac a palm-tree green. Lycopodium, used also in the manufacture of stage-lightning, burns with a rose color and a magnificent flame. See *Fireworks.*

Pyroxylic Spirit (pī-roks-il′ik), a common name for methylic alcohol or wood-spirit. See *Methyl.*

Pyroxyline (pī-roks′i-lin), a term embracing guncotton and all other explosive substances obtained by immersing vegetable fiber in nitric or nitrosulphuric acid, and then suffering it to dry. These substances are nitroderivatives of cellulose.

Pyrrha. See *Deucalion.*

Pyrrhic Dance (pir′ik), an ancient Grecian warlike dance, which consisted chiefly in such an adroit and nimble turning of the body as represented an attempt to avoid the strokes of an enemy in battle, and the motions necessary to perform it were looked upon as a kind of training for war.

Pyrrho (pir′rō), a Grecian philosopher of Elis, founder of the Pyrrhonian or skeptical school, flourished about 340 B.C. He was early led to apply himself to philosophy by the writings of Democritus, and, accompanying his master, Anaxarchus, to India, in the train of Alexander the Great, he there became acquainted with the doctrines of the Brahmans, Magi, and other eastern philosophers. Spending a great part of his life in solitude, and abstaining from all decided opinions concerning moral and physical phenomena, he endeavored to attain a state of tranquillity not to be affected by fear, joy, or sorrow. He died in his ninetieth year; the Athenians erected a statue in honor of him, and his countrymen, who had made him a high-priest, raised a monument to his memory. His chief doctrines were the uncertainty of all human knowledge, and the belief that virtue is the only good. Pyrrho left no writings. It is only from the works of his later followers, particularly Sextus Empiricus, that we learn the principles of his school. A disposition to doubt is often called, from this philosopher, *Pyrrhonism.*

Pyrrhus (pir′rus), king of Epirus, one of the most notable generals of antiquity, was born about 318

B.C., and was left an orphan in childhood. He was placed on the throne of his ancestors when about twelve years of age, and reigned peacefully five years, when advantage was taken of his absence to transfer the crown to his great-uncle, Neoptolemus. After serving with his brother-in-law, Demetrius Poliorcetes, and greatly distinguishing himself at the battle of Ipsus, against Antigonus, B.C. 301, Pyrrhus recovered his dominions, which he shared with his rival, and then caused the latter to be put to death. He next contended for possession of Macedonia, and in 280 passed over into Italy to assist the Greeks against Rome. He defeated the Romans in two battles, but with severe loss to himself; then passed over into Sicily, returned to Italy again, and was defeated at Beneventum 275 B.C. He now retired to Epirus, took part in the Greek troubles, and was killed at Argos, B.C. 272.

Pyrus (pī′rus), a genus of ornamental and fruit trees, the latter forming the chief of our orchard fruit, and belonging to the pomeous section of the nat. order Rosaceæ. There are about forty species, natives of the north temperate and cold regions. The pear (*P. commūnis*), the apple or crab (*P. Malus*), service-tree (*P. torminālis* and *domestica*), mountain-ash or rowan-tree (*P. Aucuparia*), beam-tree (*P. Aria*), etc., all belong to this genus.

Pythagoras (pi-thag′o-ras), a Grecian philosopher, supposed to have been born about 586 B.C. at Samos. He went to Scyros, and was a scholar of Pherecydes till the death of the latter; others make him also a scholar of Thales and Anaximander. He is said to have gathered knowledge from the philosophers or learned men of Phœnicia, Syria, Egypt, Babylon, India, etc., but eventually settled at the Greek city of Crotona in Lower Italy, probably about 529 B.C. His abilities and character led great numbers, chiefly of the noble and wealthy classes, to adopt his views. Three hundred of these were formed into a select fraternity or order, and were bound by vow to Pythagoras and each other, for the purpose of cultivating the rites and observances enjoined by their master, and studying his philosophy. They thus formed at once a philosophical school and a religious order. The political influence of this body became very considerable, and was exerted in the interest of the aristocratic party. The democratic party strenuously opposed the growing power of the order, and their enmity caused Pythagoras to retire to Metapontum, where he died about 506 B.C. So far as we can judge, his system appears to owe very much to a vivid imagination acting upon the then prevailing ignorance respecting the order of nature. What was not known was guessed at, with the usual result. In the case of Pythagoras, as in that of other teachers of those early times, the popular effect of this partial knowledge was heightened by mingling it with secret doctrines. One of these doctrines was the transmigration of souls; and Pythagoras is said to have believed himself to have previously lived in several bodies. He had also abstruse theories respecting numbers, geometry, and music, which he valued very highly as fitting the soul for contemplation. The effect of his teaching, however, was such that his disciples are said to have paid him divine honors after his death. In appearance he was grave, commanding, and dignified. He abstained from all animal food, limiting himself to a vegetable diet. His public instruction consisted of practical discourses in which he recommended virtue and dissuaded from vice, with a particular reference to the various relations of mankind, as those of husbands and wives, parents and children, citizens and magistrates, etc. His disciples were required to practice the greatest purity and simplicity of manners. He imposed upon them, it is said, a silence of from two to five years, according to circumstances. He alone who had passed through the appointed series of trials was allowed to hear the word of the master in his immediate presence. To the initiated the doctrines were not delivered, as to others, under the mask of images and symbols, but unveiled. Pythagoras left no writings, the *Golden Sentences* extant under his name having been composed or compiled by later hands.

Pythagorean Bean (pith-ag-u-rē′-an), the *Nelumbium speciosum*. See *Nelumbium*.

Pythagorean Theorem, the forty-seventh proposition of the first book of *Euclid's Elements*, which shows that in any right-angled triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Pytheas (pith′e-as), a famous navigator of the Greek colony of Massilia, now Marseilles, supposed to have lived about the time of Alexander the Great (say 330 B.C.). He is reputed to have sailed along the west coast of Europe, entered the English Channel, and traveled some distance in Britain, then, continuing his journey northward, to have arrived at Thule (supposed to be Iceland). In a second voyage he en-

tered the Baltic, where he proceeded as far as a river which he called Tanais, and on the banks of which amber was found. We only know of him through Strabo, Pliny, and others.

Pythian Games (pith'i-an), one of the four great Grecian games, instituted in honor of Apollo, and celebrated at Delphi. Until about 586 B.C. they were under the management of the Delphians, and took place every eighth year; but after that date they were conducted by the Amphictyons, and celebrated every fourth year, prizes being given for flute-playing, athletic sports, and horse and chariot racing. Eventually contests in tragedy, painting, sculpture, etc., were added. At first prizes of silver or gold were awarded, but afterwards the simple laurel wreath and palm branch were substituted. They continued to be celebrated until the end of the fourth century of our era.

Pythias, Knights of, a benevolent and friendly order, founded in the United States in 1864, and now strong in this country and flourishing in some other countries. It had a membership in 1911 in the United States of 711,381. It has an insurance department with a membership numbering 69,989, representing an aggregate life insurance of $98,527,523.

Python (pī'thon), a genus and family of serpents allied to the family Boidæ or Boas. They are not venomous, but kill their prey by compression. The pythons belong exclusively to the Old World, and are of enormous size, sometimes attaining a length of 30 feet. They are found in India and in the islands of the Eastern Archipelago, in Africa and in Australia. A rudimentary pelvis and traces of hinder limbs exist in the pythons, these structures terminating externally in a kind of hooked claw. The head exceeds the neck in thickness, and the mouth is extremely large. Aided by their prehensile tails and rudimentary hinder limbs, the pythons suspend themselves from the branches of trees and lie in wait near water for animals which come to drink. The genus *Python* contains various species, the best known of which is the West African python (*P. sebæ*), common in menageries. The female python hatches her eggs by the heat of her body.

Pythoness (pī'thon-es), the priestess of Apollo at his temple at Delphi, who gave oracular answers. See *Delphi*.

Pyx (piks; Greek, *pyxis*, a box), a covered vessel used in the Roman Catholic Church to contain the consecrated host. In ancient times, although generally rectangular in shape, it sometimes had the form of a dove, and was suspended above the altar. It is now cylindrical, cup or bell shaped, with a cross-surmounted cover, and is frequently delicately chased and inlaid.

Pyx, Trial of the, the final trial by weight and assay of the gold and silver coins of the United Kingdom, prior to their issue from the mint, a certain number being taken and tested by way of sample of the whole. The trial takes place periodically by a jury of goldsmiths summoned by the lord-chancellor, and constitutes a public attestation of the standard purity of the coin. The term is also applied to the assaying of gold and silver plate, which takes place at the different assay offices.

Pyxidium (piks-id'i-um), in botany, a capsule with a lid, as seen in henbane and in the fruit *Lecythis Ollaria*, the monkey-pot tree, a large forest tree of Brazil. The term is also applied to the theca of mosses.

Q

Q, the seventeenth letter in the English alphabet, a consonant having the same sound as *k* or hard *c*. It is a superfluous letter in English, as the combination *qu*, in which it always occurs, could be equally well expressed by *kw* or *k* alone when the *u* is silent. It did not occur in the Anglo-Saxon alphabet, the sound *qu* in Anglo-Saxon words being regularly written *cw* or *cu*, but was borrowed from the French-Latin alphabet.

Quackenbos (kwak'in-bos), JOHN DUNCAN, author, born at New York in 1848. He became a doctor; a tutor in rhetoric at Columbia College in 1870; professor of rhetoric at Columbia and at Barnard College for Women after 1891; professor *emeritus* at Columbia in 1894. He has written numerous school books and other works, including *Hypnotic Therapeutics* and *Enemies and Evidences of Christianity.*

Quadi (kwa'dē), a Teutonic tribe whose ancient territory was on the Danube, extending to the Theiss on the east and to the Carpathian Mountains on the north. They long waged destructive wars with the Romans, particularly under Marcus Aurelius, but cease to be heard of in the fifth century, having probably migrated further west with the Suevi.

Quadragesima (kwod-ra-jes'i-ma), a Latin word signifying fortieth, and used to denote the forty days of fast (Lent) preceding Easter. Quadragesima Sunday is the first Sunday in Lent. See *Lent.*

Quadrangle (kwod'ran-gl), in geometry, a quadrilateral figure; a plane figure having four sides, and consequently four angles. In ordinary language it is a square or quadrangular court surrounded by buildings, as often seen in the buildings of a college, school, or the like.

Quadrant (kwod'rant), an instrument for measuring angular altitudes, variously constructed and mounted for different specific uses in astronomy, navigation, surveying, etc., consisting originally of a graduated arc of 90°, with an index or vernier, and either plain or telescopic sights, along with a plumb-line or spirit-level for fixing the vertical or horizontal direction. Its principle and application is the same as that of the sextant, by which it is superseded. See *Sextant.*

Quadrate Bone (kwod'rāt), a bone developed in reptiles and birds, by means of which the lower jaw is articulated or joined to the skull. The lower jaw of these forms is thus not articulated directly or of itself to the skull, as in mammals.

Quadratic Equations. See *Equation.*

Quadrature (kwod'ra-tūr), in astronomy, the position of the moon or a planet when its longitude differs from that of the sun by 90°; that is, when it is 90° distant from the sun.— *Quadrature of the circle*, the squaring of the circle. See *Circle.*

Quadriga (kwod-rī'ga), an ancient two-wheeled car or chariot drawn by four horses abreast. It was used in racing in the Greek Olympian games, and in the games of the Roman circus.

Quadrilateral (kwod-ri-lat'er-al), a name given to the space inclosed between, and defended by, four fortresses in Northern Italy famous in Austro-Italian history, namely, Peschiera and Mantua on the Mincio, and Verona and Legnago on the Adige.

Quadrille (kwod-ril'), a dance of French origin, which consists generally of five consecutive figures or movements, danced by four sets of couples, each forming the side of a square.

Quadrille, a game at cards, played by four persons, with a pack of forty cards, the eight, nine and ten of each suit being thrown aside. Quadrille was very popular and fashionable in England about the beginning of the century, but is now almost forgotten. *Ombre*, the game celebrated by Pope in his Rape of the Lock, is essentially the same game, but played by three persons instead of four.

Quadrivium (kwod-riv'i-um), the name given by the schoolmen of the middle ages to the four mathematical branches of study, arithmetic, music, geometry, and astronomy.

Quadrumana (kwod-rö'ma-na, or 'four-handed'), the name applied by Cuvier and others to denote the order of mammalia represented by the lemurs, monkeys, and apes, from the fact that these forms agree in possessing a great toe so constructed as to be capable of opposing the other digits of the feet, instead of being placed parallel with the other toes, thus forming a kind of 'hand' adapted for supporting the foot on the ground. This conversion of the feet into hand-like organs presented to Cuvier's mind so different and remarkable a structure from the disposition of the feet and toes of man, that he separated man as a sole and single genus to

The Mandrill (*Papio maimom*).

represent the distinct and opposing order of *Bimana* or 'two-handed' mammalia. But in modern zoology this distinction is held not to exist anatomically, and man is generally included in one order with the apes and monkeys — the order Primates, of which man constitutes a distinct family or section. As limited to the apes, monkeys, and lemurs, the Quadrumana are characterized by the following points: — The hallux (innermost toe of the hind-limb) is separated from the other toes, and is opposite to them, so that the hind-feet become prehensile hands. The pollex (innermost toe of the fore-limbs) may be wanting, but when present it also is usually opposable to the other digits, so that the animal becomes truly quadrumanous, or four-handed. The teats are two in number, and the mammary glands are on the chest as in man. See *Lemurs*, *Monkeys*, *Apes*, etc.

Quadruped (kwod'rö-ped), the name popularly applied to those higher vertebrate animals which possess four developed limbs. The name is usually restricted to four-footed mammals.

Quadruple Alliance (kwod'rö-pl), an alliance, so-called from the number of the contracting parties, concluded in 1718 between Great Britain, France, and Austria, and acceded to by Holland in 1719, for the maintenance of the Peace of Utrecht. The occasion of the alliance was the seizure by Spain of Sardinia in 1717, and Sicily in 1718, both of which she was forced to give up. Another quadruple alliance was that of Austria, Russia, Great Britain, and Prussia, in 1814, originating in the coalition which had effected the dissolution of the French Empire.

Quæstor (kwēs'tur), the name of certain magistrates of ancient Rome whose chief office was the management of the public treasure, being receivers of taxes, tribute, etc. Quæstors accompanied the provincial governors and received taxes, paid the troops, etc. The office could at first be held only by patricians until 421 B.C., when the number, which had formerly been two, was doubled, and plebeians became eligible. The number was further increased to eight after the outbreak of the first Punic war. As province after province was added to the Roman territory the number of quæstors was again increased, till under Sulla it reached twenty, and in the time of Julius Cæsar forty.

Quagga (kwag'a; *Equus Quagga*), a species of the horse genus, nearly allied to the zebra, and formerly found abundantly on the plains of Southern Africa, south of the Vaal River. Though striped like the zebra, it possessed no bands on the limbs; of a dark or blackish-brown on the head, neck, and shoulders, the back and hind quarters were of a lighter brown, while the croup was of a russet gray. The under parts of the body were white, the upper parts of the legs and tail being marked by whitish bars. The quagga was of smaller size than the zebra, and in general conformation bore a closer resemblance to the horse. Gregarious in habits, the quagga is said to have mingled indiscriminately with the zebra herds. Its food consisted of grasses and mimosa leaves. It is now said to be absolutely extinct, having been hunted indiscriminately by the Boers, who killed thousands of them for their skins. In this respect its fate resembles that of the bison of America. The ani-

mal to which the name quagga is now applied is Burchell's zebra. See *Dauw.*

Quail (kwāl; *Coturnix*), a genus of rasorial birds, included in the family of the partridges, to which they are nearly allied, but from which they differ in being smaller, in having a relatively shorter tail, no red space above the eye, longer wings, and no spur on the legs. The common quail (*C. vulgāris*) is a migratory bird, and is found in every country of Europe, and in many parts of Asia and Africa. It is about 8 inches in length. The color of the upper parts is brownish with lighter and darker markings, of the under parts yellowish. The quail is very pugnacious, and in some places quail fights are a form of amusement, as was the case also in ancient times. Its flesh is deemed excellent food, and large numbers are brought alive and dead from the Continent to the British markets. In Britain these birds arrive early in May, and depart southwards in

Common Quail (*Coturnix vulgāris*).

October. There are several other species, in appearance and habits not greatly differing from the common quail, as the Coromandel quail (*C. textilis*), the Australian quail (*C. australālis*), the white-throated quail (*C. torquāta*), the Chinese quail (*C. excalfactoria*), an elegant little species measuring only 4 inches in length, etc. The name quail is given in the United States to some birds of other genera, as the Virginia quail, or partridge (*Ortyx*), and the Californian or crested quail (*Lophortyx*). The Virginian quail is common throughout North America, and extends as far south as Honduras. It is rather larger than the European quail. The flesh is very white and tender, and is unequaled in delicacy by any other member of its order in America.

Quakers (kwā'kerz), or FRIENDS, a society of Christians which took its rise in England about the middle of the 17th century. George Fox, a native of Drayton, in Leicestershire, was the first to teach the religious views which distinguish the society. He commenced his ministerial labors in 1647, and immediately fell under persecution. But persecution, as usual, enlisted the sympathies of many in his cause. After making multitudes of converts he organized them into a church, which became, although not until after severe persecution, one of the recognized sects of Christianity. Among the eminent members of the society in its early days we may mention William Penn, Robert Barclay, George Whitehead, Stephen Crisp, Isaac Pennington, John Crook, Thomas Story, etc. The early Quakers were marked as a peculiar people by their testimonies against oaths, a paid ministry, and tithes; their use of the singular pronouns when addressing only one person; their refusal to take off the hat as a compliment to men; the plainness of their apparel; and their disuse of the ordinary names of the months and days. The name Quakers was given to them in derision, and though they accepted the name they call themselves by that of Friends. A Derby magistrate was the originator of the derisive epithet according to Fox himself —'because I made him tremble at the word of God.' The persecution and intolerance, of which they were the victims both in England and America, only tended to confirm the faith and strengthen the bond of union among the members of the rising society; and in neither country could it induce the sufferers to relinquish their conformity to what they regarded as duty. From the diffusion of more enlightened views on the subject of religious liberty, acts were successively passed by the English parliament relieving Friends from the oppression under which they suffered, tolerating their mode of worship, marriage, etc., and allowing them in a court of justice to make an affirmation in place of taking an oath in the usual way. The same liberal policy was pursued in America. One of the brightest chapters in the annals of the sect is that relating to the founding of the colony of Pennsylvania. (See *Penn, William, Pennsylvania.*) But, as in other reforming sects, so among the Friends, success in the course of time gradually undermined their zeal, and deprived them of many of their characteristic qualities. Gradually the spread of wealth modified the stringency of their 'sumptuary' rules, and there was in consequence a rapid decline of the ancient discipline. Coincident with these relaxations of rule arose disputes as to doctrine. About the year 1827 Elias Hicks, a native of the state of New York, created a schism in the society by promulgating opinions denying the miraculous conception, divinity, and atonement

of Christ, and also the divine authority of the Scriptures. One-fourth the sect in America followed Hicks, and have since been known as Hicksite Friends. The schism made much stir among Friends in Great Britain as well as in America, and a movement was begun in favor of higher education, and of a relaxation in the formality of the society. This movement, headed by Joseph John Gurney of Norwich, was strenuously opposed by a body of Friends in America, and the result was a division among the Orthodox Friends themselves, and the origin of a new sect, known as Wilburites, from John Wilbur, its founder.

The society, or the orthodox section of it, believes that, under the gospel dispensation, all wars and fightings are strictly forbidden; the positive injunction of Christ, 'Love your enemies,' etc., entirely precluding the indulgence of those passions from which only such contests can arise. They also believe that the express command, 'Swear not at all,' prohibits the Christian from the use of judicial as well as other oaths. In like manner, following the spirit of the Scriptures, they believe that a special call is necessary to constitute a true minister of the gospel, that the faithful minister should not preach for a pecuniary reward, that the essential baptism is of the Holy Ghost, not by water, and that the Lord's supper is also entirely of a spiritual nature. They therefore renounce both these sacraments so far as the ordinary outward forms are concerned. As to the cardinal doctrines of Christianity, the incarnation, crucifixion, resurrection, redemption through Christ's death, justification, etc., their beliefs are similar to those of orthodox Christians generally. The Friends were one of the first sects to allow women to teach publicly. As early as 1727 they censured the traffic in slaves, and the efforts of the society had a great influence in bringing about their emancipation. They object to balls, gaming places, horse races, theaters, and music; also to the reading of plays, romances, and novels; and enjoin plainness of dress and the avoidance of ornaments.

The society is governed by its own code of discipline, which is enacted and supported by meetings of four degrees for discipline — namely, preparative, monthly, quarterly, and yearly meetings. The preparative digest and prepare the business for the monthly meetings, in which the executive power is principally lodged, subject, however, to the revision and control of the quarterly meetings, which are again subject to the supervision and direction of the yearly meetings. There are about 60,000 members and adherents in Britain, 120,000 in the United States, besides small numbers in other countries.

Quaking Grass (*Briza*), a genus of grasses, so-named from their spikelets being always in a state of tremulous motion, in consequence of the weakness of the footstalks by which they are supported. *Briza maxima*, a native of Southern Europe, has long been cultivated as a garden annual on account of its large and handsome drooping spikelets. *B. media*, a perennial plant, is naturalized in the vicinity of Boston, its flowers forming elegant panicles.

Quamash (kwam'ash), the North American name of *Camassia esculenta*, a plant of the lily family with an edible bulb. These bulbs are much eaten by the Indians, and are prepared by baking in a hole dug in the ground, then pounding and drying them into cakes for future use.

Quamoclit (kwam-ok'lit), a genus of climbing ornamental plants, nat. order Convolvulaceæ, chiefly found in the hot parts of America, but some species are indigenous both in India and China.

Quandang (kwan'dang), the edible fruit of a species of sandalwood tree, *Santălum acuminātum*, called in Australia native peach.

Quangsee. See *Kwangsi.*

Quangtung. See *Kwangtung.*

Quantity (kwon'ti-ti), that property of anything, in virtue of which it is capable of being measured, increased, or diminished, relating to bulk, weight, or number. In mathematics a quantity is anything to which mathematical processes are applicable. In grammar it signifies the measure of a syllable, or the time in which it is pronounced — the metrical value of syllables as regards length or weight in pronunciation. In Latin and Greek poetry quantity and not accent regulates the measure.

Quantock Hills (kwan'tok), a range of low elevation in England, in the county of Somerset, extending from the Bristol Channel, near Watchet, northeast to between Bridgewater and Taunton, and rising at their highest point to an elevation of 1428 feet above the sea-level.

Quanza, a river of Africa. See *Coanza.*

Quappelle (ka-pel'), a small town on the Canadian Pacific

Railway, in the district of Assiniboia, a short distance east of Regina; also, the name of a river tributary to the Assiniboine.

Quarantine (kwor'an-tēn; It. *quarantina*, a space of forty days), the period (originally forty days) during which a ship coming from a port suspected of contagion, or having a contagious sickness on board, is forbidden intercourse with the place at which she arrives. This form of quarantine is confined to countries where cholera, yellow fever, etc., have to be guarded against. By act of Congress passed in 1888 national quarantine stations were established; and it is made a misdemeanor, punishable by fine or imprisonment, or both, for the master, pilot, or owner of any vessel entering a port of the United States in violation of the act, or regulations framed under it. Quarantine was first introduced at Venice in the fourteenth century. In Britain it is now practically abolished, the port sanitary authorities dealing with any case reported to them.

Quaregnon (kȧ-ren-yōn), a commune and colliery district of Belgium, province of Hainaut, 4 miles west of Mons. It has coal mines and blast furnaces. Pop. 16,033.

Quarles (kworlz), FRANCIS, an English poet, born in 1592, near Rumford in Essex, educated at Cambridge, and entered at Lincoln's Inn. He was for some time cup-bearer to Elizabeth, queen of Bohemia, and in 1621 went to Dublin, where he became under-secretary to Archbishop Ussher. He was driven from Ireland, with the loss of his property, by the rebellion of 1641, and was appointed chronologer to the city of London. At the commencement of the civil wars he wrote a work entitled the *Loyal Convert*, which gave offense to the parliament; and when he afterwards joined the king at Oxford his property was sequestrated, and his books and MSS. plundered. He was so much affected by his losses, that grief is supposed to have hastened his death in 1644. Of the works of Quarles, in prose and verse, the most celebrated is his *Emblems*, a set of designs illustrated by verses. Among his poems are *Divine Poems*, *Divine Fancies*, and *Argalus and Parthenia*. His *Enchiridion* is a collection of brief essays and aphorisms, in vigorous and occasionally eloquent language.

Quarnero (kwär-nā'rō), GULF OF, in the Adriatic Sea, between Istria and the Croatian coast, 15 miles in length and breadth. It is nearly inclosed leewards by the islands of Cherso and Veglia, and communicates with the Adriatic by three channels. The seamen of that region dread the gulf on account of the terrific storms to which it is subject.

Quarrel (kwor'el), a bolt or dart to be shot from a cross-bow, or thrown from a catapult, especially one with a square head and pyramidal point.

Quarrel.

Quarry (kwor'i), an open excavation made for obtaining stone, such as granite, marble, sandstone, limestone, and slates. Stones suitable for important building purposes are usually found at a good distance below the surface. In the case of unstratified rocks, such as granite, whinstone, etc., the stone is most frequently detached from the mass by blasting, a process by which much valuable stone is wasted, and a different method is employed whenever it is found possible. This is frequently the case with some stratified rocks, such as sandstone, from which blocks are separated by hand-tools alone. Small holes a few inches asunder are cut along a certain length of rock, into which steel wedges are inserted. These are driven in by heavy hammers until the stratum is cut through. The large blocks necessary for monumental purposes are generally obtained in this way, and before they leave the quarry they are usually reduced as nearly as possible to a rectangular form.

Quart (kwort), a measure of capacity, being the fourth part of a gallon, or eight gills.

Quartan Ague. See *Ague*.

Quarter (kwor'ter), the name of two measures, one of weight and the other of capacity. The first is the fourth part of a hundredweight, or 28 lbs. The second contains 8 bushels of 4 pecks.

Quarter, that part of a ship's side which lies towards the stern, or which is comprehended between the aft-most end of the main chains and the sides of the stern.

Quarter-days, in England, the day that begins each quarter of the year. They are Lady-day (March 25), Midsummer-day (June 24), Michaelmas-day (September 29), Christmas-day (December 25). These days have been adopted between landlord and tenant for entering or quitting lands or houses and for paying rent. In Scotland the legal terms are, Whitsunday (May

15), and Martinmas (November 11); the conventional terms Candlemas (February 2), and Lammas (August 1) make up the quarter-days.

Quarter-deck, the upper deck, or aftermost part of the upper deck, of a vessel, extending from the main-mast to the stern, or to the poop (when there is one). In ships of war it is specially set apart for the officers.

Quartering (kwor'ter-ing), in heraldry, is dividing a coat into four or more quarters or quarterings, by perpendicular and horizontal lines, etc. See *Heraldry*.

Quarter-master (kwor'ter-mas'ter), in the army, an officer who attends to the quarters for the soldiers, their provisions, fuel, forage, etc. There is a quarter-master on the staff of each regiment, in which he holds the relative rank of lieutenant. A quarter-master in the navy is a petty officer appointed by the captain, who, besides having charge of the stowage of ballast and provisions, coiling of ropes, etc., attends to the steering of the ship.

Quartermaster-general, a staff officer of high rank in the army, whose department is charged with all orders relating to the marching, embarking, disembarking, billeting, quartering, and cantoning of troops, encampments and camp equipage. The quartermaster-general is attached to a whole army under a commander-in-chief, and holds the rank of brigadier-general.

Quartermaster-sergeant is a non-commissioned officer who acts as assistant to the quarter-master.

Quartern (kwor'tern), a term sometimes used to designate the fourth of a peck, or of a stone; as the quartern-loaf. In liquid measure it is the fourth part of a pint.

Quarter-sessions, in England, a general court of criminal jurisprudence held quarterly by the justices of the peace in counties, and by the recorder in boroughs. The jurisdiction of these courts, originally confined to matters touching breaches of the peace, has been gradually extended to the smaller misdemeanors and felonies, but with many exceptions. Similar courts have been introduced into the United States, and are closely connected with courts of Oyer and Terminer (which see).

Quarter-staff, an old English weapon formed of a stout pole about 6½ feet long, generally loaded with iron at both ends. It was grasped by one hand in the middle, and by the other between the middle and the end. In the attack the latter hand shifted from one quarter of the staff to the other, giving the weapon a rapid circular motion, which brought the loaded ends on the adversary at unexpected points.

Quartet, or QUARTETT (kwor-tet'), a musical composition for four instruments, generally stringed instruments (that is, two violins, one viola or tenor violin, and one violoncello); also a composition for four voices, with or without accompaniment.

Quarto (kwor'tō; 4to), a book of the size of the fourth of a sheet; a size made by twice folding a sheet, which then makes four leaves.

Quartz (kwortz), the name given to numerous varieties of the native oxide of silicon, called also silicic acid. Quartz embraces a large number of varieties. When pure its composition is expressed by the formula SiO_2. It occurs both crystallized and massive, and in both states is most abundantly diffused throughout nature, and is especially one of the constituents of granite and the older rocks. When crystallized it generally occurs in hexagonal prisms, terminated by hexagonal pyramids. It scratches glass readily, gives fire with steel, becomes positively electrical by friction, and two pieces when rubbed together become luminous in the dark. The colors are various, as white or milky, gray, reddish, yellowish or brownish, purple, blue, green. Quartz veins are often found in metamorphic rocks, and frequently contain rich deposits of gold. The principal varieties of quartz known by distinct names are the following: 1, *rock-crystal;* 2, *smoky quartz;* 3, *yellow quartz;* 4, *amethyst;* 5, *siderite* or *blue quartz;* 6, *rose quartz;* 7, *milky quartz;* 8, *irised quartz;* 9, *common quartz;* 10, *fat (greasy) quartz;* 11, *flint;* 12, *hornstone;* 13, *Lydian stone;* 14, *floatstone (swimming stone);* 15, *fibrous quartz;* 16, *radiating quartz;* 17, *chalcedony;* 18, *carnelian;* 19, *chrysoprase;* 20, *agate.* The name rock-crystal is applied to transparent and colorless crystals. Smoky quartz consists of crystals and crystalline masses which are translucent and of a brown color. Yellow quartz, sometimes called *Bohemian* or *Scottish topaz,* is transparent, and of various shades of yellow. Amethyst is of every shade of violet, and nearly transparent. Siderite is of an azure-blue color, and never in regular crystals. Rose quartz is of a rose-red color. Milky quartz is massive, translucent, and of a milk-white color.

Irised quartz exhibits the colors of the rainbow. Fat or greasy quartz has the appearance of having been immersed in oil. Flint has a more compact texture than common quartz, is dull, only translucent on the edges, of a brownish color, and breaks with a conchoidal fracture. Hornstone resembles flint, but its conchoidal fracture is less distinct. Lydian stone differs from flint chiefly in having a darker color, less translucency, and a fracture somewhat slaty; when black it is often called *basanite*. Floatstone consists of a delicate tissue of minute crystals, visible only under a powerful magnifier. Owing to the cavities it contains it will sometimes float on water. Fibrous quartz consists of those varieties which are in distinct parallel concretions. Radiating quartz is like fibrous quartz, except that the fibers diverge from a common center, and resemble the radii of a circle, instead of being parallel. Chalcedony includes those varieties of radiating quartz where the thickness of the individuals becomes so much diminished as to render them nearly or altogether impalpable. Carnelian differs from chalcedony merely in having a blood-red color. Chrysoprase also resembles chalcedony in composition, except that it is granular instead of fibrous; its color is apple-green. Agate implies the occurrence of two or more of the above varieties existing together in intimate union. Cat's eye, avanturine, prase, plasma, heliotrope, Compostella hyacinth, jasper (red, brown, striped, and porcelain), jasper agate, Mocha stone, Venus-hair agate, etc., formerly included under quartz, are only mixtures of this mineral with other substances. Several varieties of quartz are of important use in the arts and manufactures. The ancients regarded rock-crystal as petrified water, and made use of it for the fabrication of vases. At present it is employed not only for cups, urns, chandeliers, etc., but for seals, spectacle-glasses, and optical instruments. Quartz enters into the composition of glass, both white and colored. In the manufacture of porcelain it is added in the state of an impalpable powder, and forms part of the paste; it is also used in other kinds of pottery. Quartz is used as a flux in the melting of several kinds of ores, particularly those of copper, and in other metallurgical processes. Touchstone is a hard velvety-black variety of Lydian stone.

Quartzite (kwort'zīt), QUARTZ-ROCK, a metaphoric stratified granular-crystalline rock consisting entirely, or almost entirely, of quartz. It is usually a sandstone which has been altered by heat, etc. It is generally of a grayish or pinkish-gray color, from a slight trace of iron.

Quass (kwas), or KVASS, a sour, fermented liquor, made by pouring warm water on rye or barley meal, and drunk by the peasantry of Russia.

Quassia (kwash'i-a), a genus of South American tropical plants, consisting of trees and shrubs, natural order Simarubaceæ. The wood of two species is known in commerce by the name of *Quassia; Q. amāra*, a native of Panama, Venezuela, Guiana, and Northern Brazil, a small tree with handsome crimson flowers; and *Q. excelsa* (*Picræna excelsa*, Lindley), a native of Jamaica. The latter furnishes the *lignum quassiæ* of the British Pharmacopœia. Both kinds are imported in billets, and are inodorous, but intensely bitter, especially the Jamaica quassia. Quassia is a pure and simple bitter, possessing marked tonic properties. An infusion of quassia sweetened with sugar is useful to destroy flies. *Q. excelsa* was formerly substituted by some brewers for hops, but is now prohibited under severe penalties.

Quaternions (kwa-ter'ni-unz), the name given by Sir William Rowan Hamilton to a method of mathematical investigation discovered and developed by him. It is most important in its applications to physics, especially in crystallography, optics, kinematics, and electro-dynamics. According to the discoverer, 'A *Quaternion* is the quotient of two vectors, or of two directed right lines in space, considered as depending on a system of *Four Geometrical Elements;* and as expressible by an algebraical symbol of *Quadrinomial Form*. The science, or *Calculus*, of *Quaternions*, is a new mathematical method wherein the foregoing conception of a *quaternion* is unfolded, and symbolically expressed, and is applied to various classes of algebraical, geometrical, and physical questions, so as to discover many new theorems, and to arrive at the solution of many difficult problems.'

Quatre-Bras (kâ-tr-brä), a village of Belgium, in the province of South Brabant, 20 miles S. S. E. of Brussels, situated at the intersection of the main roads between Brussels and Charleroi, and from Nivelle to Namur. It is famous for the battle fought here (June 16, 1815) between the English under Wellington and the French under Ney, in which the former were victorious.

Quatrefages de Bréau (kä-tr-fäzh dė brā-ō), JEAN LOUIS ARMAND DE, a French

naturalist, born in 1810; took his M.D. degree at Strasburg in 1838; and became professor of zoology at Toulouse, the Lycée at Paris, and professor of anatomy and ethnology at the Musée d'Histoire Naturelle. He was elected a member of the Royal Society, London, in 1879. His contributions to science include numerous researches into the lower grades of life, and a valuable series of anthropological studies. Among his more important works are *Souvenirs d'un Naturaliste* (1854), *Crania Ethnica* (1875-79), *De l'Espèce Humaine* (1877), *Hommes Fossiles et Hommes Sauvages* (1883), *La Distribution Géographique des Négritos* (1883), *l'Homme Tertiaire* (1885), *les Pygmées* (1887), and *Introduction à l'Étude des Races Humaines* (1887-89). He died in 1892.

Quatrefoil (kwą'tėr-foil), in architecture, an opening or a panel divided by cusps or foliations into four leaves, or more correctly the leaf-shaped figure formed by the cusps. It is an ornament which has been supposed to represent the four leaves of a cruciform flower, and is common in the tracery

Quatrefoils.

of Gothic windows. Bands of small quatrefoils are much used as ornaments in the perpendicular Gothic style, and sometimes in the decorated. The same name is also given to flowers and leaves of similar form carved as ornaments on moldings, etc.

Quaver (kwā'ver), a note and measure of time in music, equal to half a crotchet or the eighth of a semibreve. See *Music*.

Quay (kē), a landing-place substantially built along a line of coast or a river bank, or round a harbor, and having posts and rings to which vessels may be moored, frequently also cranes and storehouses for the convenience of merchant ships.

Quay (kwā), Matthew Stanley, political leader, born at Dillsburg, Pennsylvania, in 1833; died in 1904. He graduated at Jefferson College, was admitted to the bar, became a colonel in the Civil War, and was afterwards private secretary to the governor of Pennsylvania. Elected to the legislature in 1861, after holding other positions, he was elected State treasurer in 1885 and United States Senator in 1887. Shrewd and alert in political movements, he gradually gained leadership in and control of the Republican organization in Pennsylvania, what is called the 'political machine' reaching its highest development in his hands. In 1889 he was tried for misappropriation of public funds, but was acquitted. He was regarded as the ablest of leaders in 'machine' politics.

Quebec (kwē-bek'), a province of Canada, formerly known as Lower Canada, extending from Hudson Strait to the United States and the Provinces of New Brunswick and Ontario. To the east the narrow strip of Labrador coast separates it from the Atlantic, while Ontario and Hudson Bay form its western limit. For about 400 miles the province borders the Gulf of St. Lawrence, and the Strait of Belle Isle separates its far eastern portion from Newfoundland. Its land area is 690,865 square miles; total land and water area, about 707,000 square miles. It extends from east to west a distance of 1350 miles. Some 50,000 sq. miles lie south of the St. Lawrence. The population in 1901 was 1,648,898; in 1911, 2,005,776; in 1921, 2,361,199.

The entire region north of the Saguenay River, between Labrador and Hudson Bay, is largely unexplored. The valley of the St. Lawrence includes the lowlands extending along the river from the city of Quebec to the western extremity of the Province. It is a very fertile plain, in which are situated the chief cities and towns of the Province, and is thickly settled with prosperous farmers. The mountainous region, south of the St. Lawrence, includes the Notre Dame Mountains country and the Eastern Townships. The highest peak of the Notre Dame range is Sutton Mountain, over 3000 feet high. To the northeast is the high forest-clad region of the Gaspe Peninsula, in which are the Shickshock Mountains. In the Eastern Townships, to the southeast of the Notre Dame Mountains, is some of the best farming and grazing land in Canada, and the lakes there are noteworthy for their size and for the beauty of their surrounding scenery. Notwithstanding the loveliness of Lakes St. John, Memphremagog, Brome, St. Louis and St. Peter, and the myriad picturesque inland bodies of water in the Laurentian Mountains, Quebec's rivers far exceed them in fame, and as highways of commerce are of incalculable value. The St. Lawrence stands foremost, and in recent years has diverted much British and Continental

trade to Canadian ports, for it is navigable to Montreal, a city 300 miles nearer Liverpool than is New York. The mouth of the St. Lawrence is 26 miles wide, and its length from Lake Ontario to the island of Anticosti is 680 miles. The Ottawa River drains an area of 80,000 sq. miles, and after flowing 600 miles, throughout a great part of its course forming the boundary between the provinces of Quebec and Ontario, empties into the St. Lawrence by four mouths, forming the island of Montreal, and other islands. By means of two small canals the Ottawa is navigable from Montreal to the city of Ottawa; and at this city, where it narrows into the Chaudiere Falls, it is intersected by the Rideau Canal, which connects with Lake Ontario. This may in time form part of the proposed great inland waterway by which ocean liners may reach the western extremity of the Great Lakes, and merchant shipping be brought in touch with the vast wheat fields of Western Canada.

The Saguenay River drains the waters of beautiful Lake St. John, and the grandeur of the scenery throughout the sixty miles which are navigable for large steamers, proclaims it one of the most awe-inspiring scenes of Nature's handiwork. Its banks are precipitous, and the waters deep and dark, being shadowed by the high, imposing walls of rock approaching close on either side. The St. Maurice River winds 400 miles through well wooded country to the St. Lawrence, at the city of Three Rivers; while the Richelieu River, by means of the canal above Chambly, forms a passage way for boats from the St. L wrence to Lake Champlain and thence down the Hudson to New York. The falls of the Montmorency River, easily accessible for tourists from Quebec, six miles distant, make a single leap of 250 feet, and are justly famed for their marvelous beauty, as are also the Shawinigan Falls of the St. Maurice River. Of the large number of islands which form a part of the Province of Quebec, the most important is the island of Montreal, 32 miles long by 11 miles wide, with nearly 1,000,000 inhabitants, including the city of Montreal, the commercial metropolis. The Ile Jesus, close to that of Montreal, is 22 miles long by 6 wide. Anticosti Island is located in the Gulf of St. Lawrence, at the mouth of the St. Lawrence River: 130 miles long, by 34 to 40 wide. The Isle of Orleans is a fertile spot, 21 miles long, just below Quebec City; and the Magdalen Islands, in the Gulf of St. Lawrence, south of Anticosti Island, possess, besides important mackerel, cod, and halibut fisheries, large deposits of gypsum. Seven Islands, on the north shore, has become an important timber and whale fishery center.

The climate of the Province is very varied. In the valley of the St. Lawrence the summers are hot, the temperature lowering as the sea is approached. All over the Province the winters are cold, with abundant snowfall. The St. Lawrence is unfitted for navigation during about five months of the year by reason of ice. There is a compensating advantage, however, in the freezing of the rivers and lakes, as in winter they are used by the 'habitants' as highways for the transport of their produce to market. Further, a load 40% greater in winter than in summer can be hauled over the snow and river roads, and thus the winter season is of great advantage to the lumberman and the miner.

The products of the soil are abundant, and large quantities of grain and hay are exported from Montreal and Quebec; live stock, bacon beef, eggs, butter, and especially cheese, are also shipped abroad to the value of millions of dollars yearly. The field crops reach an annual value of $300,000,000. Apples, plums and melons are produced in large quantities, together with many varieties of small fruits. Over $4,500,000 is realized annually from the maple trees in sugar and syrup, and live stock is valued at more than $240,000,000. There are nearly 2000 butter and cheese factories. Almost 1,000,000 pounds of butter and cheese, worth over $35,000,000, are produced each year, and fully two-thirds of the tobacco grown in the Dominion comes from Quebec. The agricultural income of the Province in 1922 was $325,000,000.

Quebec surpasses every other Province in the matter of her forest areas. These total 130,000,000 acres, or about 30 per cent of the total acreage, and by comparison with the value of the cut of timber in other Provinces Quebec's figures are about one-third of the whole. The value of its forests is estimated at: white and red pine, $200,000,000: spruce and balsam, $250,000,000; pulpwood, $100,000,000; hardwood, $25,000,000; total, $575,000,000. As a producer of pulpwood, and of manufactured pulp, Quebec stands in the forefront of Canadian Provinces. The annual value of the timber cut in the Province is about $17,000,000.

For one highly useful mineral—asbestos—Quebec is the main source of the world's supply. The value of the output of the asbestos mines in 1922 was $15,-

000,000. Copper, iron, mica, molybdenite, and graphite are also mined. Phosphate of lime is produced in large quantities. Cement alone yields about $3,000,000 yearly. Quebec's fisheries employ more than 11,000 men, and the products of their labors net nearly $3,000,000 annually. The principal fish are cod, lobsters, herring, salmon, and mackerel. The inland waters abound in trout, pickerel, whitefish, pike and sturgeon. Quebec is a paradise for sportsmen. Thousands visit the Province annually during the hunting and fishing season. The forests, especially in the northern part, abound in game, both fur-bearing and otherwise, the rivers and streams teem with fish, while wild fowl are almost innumerable. In the Laurentides National Park, a district of 2640 sq. miles north of Quebec, caribou, partridge, and trout are found in abundance. Nearly 200,000 sq. miles of territory in Quebec have been set apart by the legislature both for forest reserve and for the preservation of fish and game.

In the amount and value of its manufactures Quebec ranks next to Ontario. There is limitless waterpower almost everywhere in the Province, which, near Montreal and Quebec, at Shawinigan, Valleyfield, and other places, has been harnessed for commercial purposes. The chief manufactures are pulp and paper, wood products, clothing, boots and shoes, rubber goods, tobacco, flour, meat products, hats and caps, gloves and mitts, leather goods, sugar, woolen and cotton goods, furs, machinery, etc. The output is valued at close to $1,000,000,000. The Province is well provided with railways. The headquarters of the Canadian Pacific Railway is at Montreal, and various lines of this rail system connect Montreal with Toronto, Ottawa, Winnipeg, Vancouver, Quebec, and St. John. The Canadian National Railways connect Montreal with Halifax, passing across the St. Lawrence at the city of Quebec; and the line from Moncton, in New Brunswick, to Prince Rupert, in British Columbia, also crosses the St. Lawrence at Quebec and proceeds on its way through the northern part of the Province. The National lines connect various local points, and by means of the old Grand Trunk system, reach important centers in the United States, while there are a number of other railway companies, with lines running in various directions. Both Montreal and Quebec are connected by steamships during the summer months with all parts of the world. The St. Lawrence is rendered perfectly safe for navigation. During the summer season, also, steamers ply on the rivers and inland waters, carrying a great deal of freight and taking care of the large tourist trade. Quebec has not adopted prohibition; it is the one officially 'wet' Province.

The chief universities are McGill, at Montreal; and Laval, at Quebec and Montreal. At St. Anne de Bellevue is an Agricultural College, affiliated with McGill University. The training of teachers for the Protestant schools of the Province is carried on at MacDonald College. Bishop's College at Lennoxville is an Anglican University. There are a number of normal schools and many technical schools.

The chief cities, with their populations in 1921 are: Montreal (618,506), Quebec (95,193), Verdun (25,001), Hull (24,117), Sherbrooks (23,515), Three Rivers (22,367), etc.

The affairs of the province are administered by a lieutenant-governor and a responsible ministry, assisted by a legislative council of 24 members appointed for life, and a legislative assembly of 81 members elected for 5 years. Women are not eligible for election to the assembly, nor are they permitted to vote. It sends to the Dominion parliament 24 senators and 65 representatives. Quebec was known as New France or Canada from 1608 to 1763; as the Province of Quebec, 1763-90; as Lower Canada, 1791-1840; as Canada East, 1841-67; and since then as the Province of Quebec.

Quebec, the capital of the Province of Quebec, founded in 1608, considered the most picturesque city in North America, situated at the confluence of St. Charles and St. Lawrence Rivers, 180 miles from Montreal, on a promontory named Cape Diamond, which has a height of 333 feet. It is a port of entry for ocean steamers in summer and landing place for immigrants. It is on the Canadian Pacific, Canadian National, and other railways. A few miles above the city, what has been called the 'eighth marvel of the world,' the Quebec Bridge, spans the St. Lawrence. The city is divided into the upper and lower towns. The former, placed on the summit of the promontory, is grouped around the Citadel, which covers 40 acres and has been styled the Gibraltar of America, being perhaps the strongest natural fortress on the continent. The view from the heights here, along the far-famed Dufferin Terrace, looking down on the river, 200 feet below, is one of the finest in the world. At the eastern end of the Terrace is a statue of Champlain, who founded the city of Quebec. In 1620 Champlain com-

menced the erection of the Fort or Castle of St. Louis, on the brow of the cliff; the site is now occupied by the Chateau Frontenac, one of the world's great hostelries. Outside the city walls, which enclose the upper town, are the Parliament, and departmental buildings and the Plains of Abraham, with statues of Wolfe and Montcalm. The lower town, the great seat of business, lies under the cliffs, along the St. Lawrence and the St. Charles. The streets are mostly narrow, irregular and frequently steep, excepting in the suburbs, which are modern and built upon a more regular plan. Among the principal edifices of Quebec are the Parliament buildings, the courthouse, postoffice, custom house and city hall, the Roman Catholic cathedral, the Church of Notre Dame des Victoires (standing upon the site of Champlain's 'Abitation' and dating back to 1648), Laval University, the Grand Seminary, etc. The celebrated shrine of Ste. Anne de Beaupre (destroyed by fire in 1922) is about 20 miles down the stream from Quebec.

Near the site of Quebec, Jacques Cartier and his sailor comrades in 1535-36 passed a season of severe privations and were the only white men on the continent of North America. Here, on May 3, 1536, Cartier erected a cross 35 feet high bearing a shield with the fleur-de-lys and the inscription in Latin: 'Francis I, By the Grace of God, King of France.' At the foot of the Rock of Quebec Champlain planted, on July 3, 1608, the white flag of France, built his 'Abitation' and founded the city of the future. In 1629 Quebec fell into the hands of the English, but was restored in 1632 to France, and in 1663 became the capital of the royal colony of New France. In 1690 and 1711 attempts were made by the British, under Sir William Phips and Sir Hovenden Walker, to capture the city, but were unsuccessful. Finally it came into the possession of the British in 1759 in consequence of Wolfe's famous victory on the Plains of Abraham. In December, 1775, the Americans attempted unsuccessfully to take the city, and General Montgomery was killed in the action.

The city ranks seventh in importance in the Dominion as a manufacturing center, the value of finished products amounting annually to $35,000,000. The principal industries are: boots, shoes, and leather tanning; machine shops, boiler shops and other steel and iron plants, printing and binding, food products, lumber and woodworking, canned goods, candy, clothing, tobacco, etc. There is abundant electric power. Population (1911) 78,710; (1921) 95,193.

Quebec Act, an Act of the English Parliament, passed in 1774, defining the Province of Quebec as extending southward to the Ohio, westward to the Mississippi, northward to the boundaries of the Hudson's Bay Territory, and eastward to the borders of Nova Scotia. It decreed that a Council was to be appointed consisting of such persons residing in the Province 'as His Majesty, his heirs and successors may be pleased to appoint.' The French civil law was recognized. Among the religious clauses the Roman Catholic clergy were authorized to 'hold, receive, and enjoy their accustomed dues and rights with respect to such persons only as shall profess the said religion,' while 'ecclesiastical persons and officers' were relieved from the necessity of taking the Elizabethan Oath of Supremacy and were given instead a simple oath of allegiance. The act was bitterly denounced in London and elsewhere, but it did the one great thing for which it was created in modifying French Canadian suspicions; and thus holding the people passive during the stormy period of the American Revolution and preventing them from falling into the swirl of French ambition and revolutionary ideas. It was replaced and extended by the Act of 1791.

Quebracho (ke-brä'chō), the name given to several trees of different genera, but with similar qualities, indigenous to South America, valuable alike for their wood and their bark. The red quebracho (*Loxopterygium Lorentii*), family Anacardiaceæ) is very hard, but splits easily. The bark and wood are used in tanning. The white quebracho (*Aspidosperma quebracho*) is used for wood-engraving. The bark contains six alkaloids, and is used therapeutically as a remedy for asthma, being employed as a decoction and a tincture. Quebracho extract is of great importance in the leather industry. It is made from quebracho wood, which contains from 18 to 24 per cent. tannin. The solid quebracho extract contains about 65 per cent. tannin and is sold on this basis. The yield of extract is about 1 ton of solid extract from 3½ tons of the wood.

Quedah (kwe'da), or KEDDAH, a small state on the west coast of the Malay Peninsula, north of Province Wellesley. It is a well-wooded and mountainous country, with numerous rivers, for the most part navigable. The climate is warm but healthy. The chief products are rice, pepper, ivory, and tin.

Pop. 30,000. The capital, of the same name, has a population of 6000.

Quedlinburg (kwed'lin-bur*h*), a town in the Prussian government of Magdeburg, province of Saxony, at the foot of the Harz Mountains, 35 miles S.W. of Magdeburg. On an eminence above the town is an old castle, once the residence of the abbesses of Quedlinburg, who, as princesses of the empire, had a vote in the diet. The manufactures are various, including woolens, beet-root sugar, wine, leather, chemicals, etc. Pop. (1910) 27,200.

Queen (kwēn; Anglo-Saxon, *cwên*, a woman), the wife of a king. In Britain the queen is either *queen-consort*, or merely wife of the reigning king, and is in general (unless where expressly exempted by law) upon the same footing with other subjects, being to all intents the king's subject, and not his equal; or *queen-regent*, regnant, or sovereign, who holds the crown in her own right, and has the same powers, prerogatives, and duties as if she had been a king, and whose husband is a subject; or *queen-dowager*, widow of the king, who enjoys most of the privileges which belonged to her as queen-consort. In Prussia, Sweden, Belgium, and France there can be no queen-regnant. See *Salic Law*.

Queen-bee, the sovereign of a swarm of bees, the only fully-developed and prolific female in the hive, all the other inhabitants being either males (that is drones) or neuters. The queen alone gives birth to new swarms. See *Bee*.

Queen Charlotte Islands, a group of islands in the North Pacific Ocean, off the mainland of British Columbia, north of Vancouver Island, discovered by Cook about 1770, and annexed to the British crown in 1787. The northernmost of the two larger islands is called Graham Island, and the southernmost Moresby Island. The greatest length of the two together is about 160 miles, and the greatest breadth (of the northern island) about 70 miles. All the islands are covered with magnificent forests; gold-bearing quartz of rich quality has been found, and copper and iron ores and a fine vein of anthracite coal also exist. There are numerous creeks suitable for harbors. The climate is excellent. The islands form part of British Columbia.

Queen Charlotte Sound, a channel in the North Pacific Ocean, separating Vancouver Island from the mainland of British America on the north, and forming the commencement of a long series of inlets continued along the north and east of that island.

Queen-of-the-meadows. See *Meadow-sweet*.

Queens' College, Cambridge, was founded in 1448 by Margaret of Anjou, queen of Henry VI, and again in 1465 by Elizabeth, queen of Edward IV. The college buildings are among the most interesting in the university. John Fisher, Thomas Fuller, and Bishop Pearson were members of the college.

Queen's College, Oxford, was founded in 1340 by Robert Eglesfield, chaplain to Philippa, queen of Edward III, and it is from her that it gets its name. The subsequent foundations of John Michel, Sir Francis Bridgman, and Lady Margaret Hungerford were consolidated into one with that of Eglesfield in 1858.

Queen's Colleges, Ireland, colleges three in number, situated respectively at Belfast, Cork, and Galway, and established in 1849 by an act of parliament passed in 1845. They are at present regulated by the charters of 1863. Students of the Queen's Colleges may obtain degrees in arts, medicine, and law from the Royal University of Ireland (which see).

Queen's County, a county of Ireland, in the province of Leinster, with an area of 664 sq. miles. The surface is generally flat, but rises in the northwest into the Slieve-Bloom Mountains, whose highest summit is 1734 feet above sea-level. Iron, copper, and manganese are found, but not worked. Limestone abounds, and in a few places marble is obtained. The soil is generally fertile, although bogs are numerous towards the center of the county. The rivers Barrow and Nore both rise in the Slieve-Bloom Mountains. Agriculture is not generally in an improving state, drainage in particular being much wanted. The principal crops are oats, barley, potatoes, turnips, and mangel-wurzel. Pop. 57,417.

Queensland (kwēnzland), one of the states of the Commonwealth of Australia, comprising the northeastern part of the continent north of New South Wales and east of South Australia and Northern Territory, being elsewhere bounded by the Gulf of Carpentaria, Torres Strait and the Pacific Ocean. A large portion is within the tropics, the most northern part forming a peninsula known as Cape York. It has an area of 670,500 square miles, and is divided into twelve large districts, namely, Moreton (East and West),

Darling Downs, Burnett, Port Curtis, Maranoa, Leichhardt, Kennedy, Mitchell, Warrego, Gregory, Burke, and Cook. Most of these districts are now subdivided into counties. Towards the west a large portion of the surface is dry and barren, but towards the east, and for a long stretch along the coast, boundless plains or downs, admirably adapted for sheep-walks, and ranges of hills, generally well wooded and intersected by fertile valleys, form the prevailing features of the country. The coast is skirted by numerous islands, and at some distance is the Great Barrier Reef. The highest mountains are near the coast, the greatest elevation being about 5400 feet. The principal rivers are the Brisbane, the Burnett, the Pioneer, the Fitzroy, and the Burdekin flowing into the Pacific, and the Flinders and Mitchell into the Gulf of Carpentaria. Some of these streams are navigable for a considerable distance inland. The coast is indented with many noble bays, affording some capacious natural harbors, which have already been brought into practical use as the outlets for the produce of the adjacent districts. The climate is healthy, and the temperature comparatively equable. The mean temperature at Brisbane is 69°, the extreme range being from 35° to 106°. In the more northern parts the climate is tropical. The rainfall in the interior is scanty and variable; the mean at Brisbane is about 35 inches. The indigenous animals and plants are similar to those of the rest of Australia. Crocodiles may be mentioned as inhabiting some of the northern rivers. There are many kinds of valuable timber trees, and a rare thing in Australia, a few good indigenous fruits. Sheep-farming is the chief industry, but agriculture (including sugar-growing), cattle rearing, and mining are also important. The soil and climate are well suited for the production of all the ordinary cereals, as well as maize, tobacco, coffee, sugar, cotton, etc. The chief products are sugar, maize, English and sweet potatoes, arrow-root, and semi-tropical fruits. Sugar-growing is becoming a very important industry. Gold, tin, lead, and copper are the principal minerals. The gold-fields extend over an area of 15,000 sq. miles. Coal and plumbago are found in large quantities; and cinnabar, antimony, and manganese are also among the mineral products. The coal-measures cover about 24,000 sq. miles; annual product about 600,000 tons. In the north pearl-fishing is actively carried on. The manufactures are unimportant. The principal manufactories, or works that may be classed as such, are sugar-mills, steam saw-mills, soap-works, agricultural implement works, and distilleries. Education is free and secular in the public schools, and is under a special department controlled by the minister for education. A Queensland university is about to be established. There is no established church, each religious denomination being entirely self-supporting. The principal imports are apparel and haberdashery, cottons and woolens, flour, iron and steel, boots and shoes, tea, spirits, hardware, machinery, wine, etc.; and the principal exports, wool, gold, tin, sugar, preserved meat, cotton, wood, hides and skins. The staple articles of export to the United Kingdom are wool, tallow, and preserved meats. A duty of 5 per cent. is charged on imports of yarns, woven fabrics, paper, stationery, etc.; and duties at other and even higher rates on other articles. The first settlement of Queensland took place in 1825, when the territory was used as a place of transportation for convicts, who continued to be sent there till 1839. In 1842 the country was opened to free settlers. It was originally a part of New South Wales, and was organized as a separate colony in 1859. The constitution for the new Australian Commonwealth was ratified by Queensland in 1899. The state has a separate parliament of two Houses, the Legislative Council and the Legislative Assembly, the Councillors being nominated by the crown, the members of the Assembly elected for three years. Women have voted since 1905. Queensland elects ten members to the Commonwealth House of Representatives. The chief towns are Brisbane, Cooktown, Maryborough, Bundaberg. Population in 1914, exclusive of 15,000 aboriginals, 678,864.

Queen's Metal. See *Britannia Metal.*

Queen's-pigeon, a magnificent ground-pigeon inhabiting the islands of the Indian Ocean, named after Queen Victoria. It is one of two species constituting the genus *Goura* (*G. Victoriæ*), and is the largest and most beautiful species of the order.

Queenstown (kwēnz'town), formerly Cove of Cork, a maritime town of Ireland, and an important naval station, 9 miles southeast of Cork, on the south side of Great Island, which rises abruptly out of Cork harbor to a considerable elevation. The streets rise above one another and present a very picturesque appearance. Queenstown is defended by fortifications on Spike Island and at the entrance of the harbor, which is large and well sheltered. It is the port for the transmission of American mails, and a chief emigration station. It

has little trade and no manufactures, being almost solely dependent on the military and naval establishments in its vicin-

ity, and on the numerous visitors attracted by the singular beauty of the place, and by its delightful climate. Pop. 7909.

Queen's-yellow, the yellow subsulphate of mercury; used as a pigment.

Quelpart (kwel'pärt), a rock-bound island, 60 miles long by 17 broad, off the south coast of Corea, of which it is a penal settlement. The soil is fertile, the climate temperate, and there is a large population. The interior is mountainous, and one summit, the volcanic Mount Auckland, is 6500 feet high.

Quentin, St. (san kaṇ-taṇ), an ancient town of France, dep. of Aisne, on a height above the Somme, 87 miles N. E. of Paris, which from its position on the frontiers between France and the Low Countries figures much in history. The French were defeated here in 1557 by the Spaniards. In 1871, in the Franco-Prussian war the French were driven out of the town after a sanguinary struggle. St. Quentin was shattered in the European war, 1914-18, many of its Gothic buildings, dating back to the 13th and 15th centuries, being destroyed. It was taken by the Germans in August, 1914, and became the center of the strongly fortified Hindenburg line. It was recaptured from the Germans on October 2, 1918, in the great Allied drive that culminated in the armistice of November 11. The staple manufactures of St. Quentin are cotton and woolen textiles, machinery and sugar. Pop. 55,571.

Quérard (kā-rär), Joseph Marie, a French bibliographer, born at Rennes in 1791; died at Paris in 1865. He was author of *La France Littéraire*, in which he gives a complete bibliography of France for the 18th and the beginning of the 19th century; *La Littérature Française Contemporaine* 1827-49; and other bibliographical works.

Quercitron (kwer'si-trun), the internal bark of the *Quercus tinctoria*, a species of oak used in manufactures for tanning leather and dyeing yellow.

Quercus. See *Oak.*

Querétaro (kā-rā'tä-rō), a city of Mexico, capital of the state of the same name, on a plateau 6365 feet above sea-level, 110 miles northwest of Mexico City. Among the more noteworthy public edifices are the principal church, a magnificent and richly-decorated structure, and an aqueduct about 2 miles long, with arches 90 feet high, which by communicating with a tunnel in the opposite hills, brings a copious supply of water from a distance of 6 miles. Maximilian of Austria, made emperor of Mexico by Napoleon III, was made prisoner and executed here in 1867. Pop. 33,152.— The State of Querétaro has an area of 3207 sq. miles, and forms part of the central plateau of the Cordillera, presenting a very rugged surface, traversed by mountain spurs and lofty heights. Grain and cattle form the chief wealth of the state. The minerals are comparatively unimportant. Pop. 232,-389.

Querimba Islands (kā-rēm'bä), a chain of low coralline islands extending along the east coast of Africa, and comprised in the Portuguese territory of Mozambique. There is a town and fort on the chief of them, Ibo.

Quern (kwern), a hand-mill for grinding corn, such as is or has been in general use among various primitive peoples. The simplest and most primitive form of the quern is that in which a large stone with a cavity in the upper surface is used to contain the corn, which is pounded rather than ground with a small stone. The most usual form consists of two circular flat stones, the upper one pierced in the center, and revolving on a wooden or metal pin inserted in the lower. In using the quern the grain is dropped with one hand into the central opening, while with the other the upper stone is revolved by means of a stick inserted in a small opening near the edge. Hand-mills of this description are used in parts of Scotland and Ireland to the present day.

Quesnay (kā-nā), François, a French physician of some eminence, but chiefly noted as a writer on political economy, born in 1694, died in 1774. He was appointed surgeon-in-ordinary to the king, and subsequently, having taken the degree of M.D., physician to Madame de

Pompadour, the mistress of Louis XV, who afterwards got him appointed physician to the king. He was the author of various surgical and medical works; of several articles in the *Encyclopédie*, in which he expounds his economical views; and tracts on politics, including a treatise on the *Physiocratic System* (1768).

Quesnel (kā-nel), Pasquier (Paschasius), a theologian and moralist, born at Paris in 1634; died at Amsterdam in 1719. He became a member of the order of the Fathers of the Oratory in 1657, at that time a great nursery of Jansenism, and wrote a number of devotional works, one of the most important of which was *Réflexions Morales sur le Nouveau Testament*, consisting of thoughts on some of the most beautiful maxims of the evangelists. This work brought him under suspicion of the church on account of its Jansenistic tendencies, and in 1685 he had to quit French territory altogether. Going to Brussels, he there applied himself to the continuation of his work on the New Testament, which was published entire in 1693-94. In this some leading points in Roman Catholicism were freely questioned. Bossuet and Noailles, archbishop of Paris, rather approved of the book; but the Jesuits obtained from Pope Clement XI a bull condemning 101 of Quesnel's propositions as heretical. This bull, known as the Unigenitus (promulgated in 1713), not only stirred up the Jansenists (see *Jansenists*), but awoke bitter dissensions in the bosom of the Gallican Church. Meantime Quesnel had been compelled to seek refuge (1703) in Holland, where he resided for the rest of his life.

Quetelet (kāt-lā), Lambert Adolphe Jacques, a Belgian statistician and astronomer, was born at Ghent in 1796, and studied at the lyceum of his native town, where, in 1814, he became professor of mathematics. In 1819 he was appointed to the same chair in the Brussels Athenæum. In 1828 he became lecturer in the Museum of Science and Literature, holding the post till 1834, when the institution was merged in the newly-established university. Quetelet superintended the erection of the Royal Observatory, and became its first director (1828). A member of the Belgian Royal Academy, he became its perpetual secretary in 1834. Quetelet's writings on statistics and kindred subjects are very numerous. He also published many papers on meteorology, astronomy, terrestrial magnetism, etc. He died in 1874.

Quetta (kwet'tä), a town of Beluchistan, strategically important as being at the entrance to the Bolan Pass, and on the road from Candahar through the Pishin Valley to Shikarpur on the Indus. It thus commands the southern route from India to Afghanistan. By treaty with the Khan of Kelat (1877), in whose territory it is, Quetta was furnished with a British garrison and strongly fortified. It contains extensive magazines of war material, and was in 1885 connected with the Indus by a line of railway. Quetta lies 5500 feet above the sea-level, and is surrounded by mountains from five to six thousand feet high.

Quetzalcoatl (kāt-zal-kō-wat'l), the god of the air of the ancient Mexicans, who presided over commerce and the useful arts, and was said by the Toltecs to have predicted the coming of the Spaniards to Mexico. This tradition aided the Spaniards in their invasion. A beneficent deity, he was finally superseded by the terrible Aztec God of War.

Quevedo y Villegas (ke-vā'dō ē vil-yā'gâs), Don Francisco de, a Spanish poet and prose writer, was born at Madrid in 1580, died in 1645. In consequence of a duel, in which his adversary fell, he fled to Italy, where his services gained him the confidence and friendship of the Duke of Ossuna, viceroy of Naples. After having visited Germany and France Quevedo returned to Spain, and on account of his connection with the duke, then in disgrace, he was arrested and confined to his estate, La Torre de Juan, for three years (1620-23). After his liberation he lived for some years in retirement, occupying himself in writing political satires, burlesque poems, and pamphlets, which obtained an extraordinary degree of success. A second long imprisonment for his satirical writings completely shattered his health, and he died soon after his liberation. His humorous productions are distinguished for playfulness, wit, and invention. His prose works are mostly effusions of humor and satire. His *Visions* ('Sueños') have been translated into most European languages; his *Vida del Gran Tacaño* is a comic romance of the sort called *picaresque*. He also translated the *Enchiridion* of Epictetus into Spanish.

Quezal (kē'zal), a most beautiful Central American bird of the Trogon family (*Trogon* or *Calurus resplendens*). It is about the size of a magpie, and the male is adorned with tail feathers from 3 to 3½ feet in length, and of a gorgeous emerald color. These feathers are not, strictly speaking, the true tail feathers (the color of which is black and

white), but are the upper tail coverts of the bird. The back, head (including the curious rounded and compressed crest), throat, and chest are of the same rich hue, the lower parts being of a brilliant scarlet. The female lacks these long

Quezal (*Trogon resplendens*).

feathers, and is otherwise much plainer. The food of the quezal consists chiefly of fruits. It lives in forests of tall trees. There are several allied species of birds, but none with the distinctive feature of the quezal.

Quezaltenango (kā-säl'tā-nän'gō), a town of Central America, in Guatemala, capital of a department of the same name, with woolen manufactures and a considerable trade. It was founded by Alvarado in 1524. Pop. (1905) about 31,000.

Quibdo (kēb-dō'), a town in the state of Cauca, of the Republic of Colombia, South America, on the Alvalo. Pop. 6856.

Quiberon (kēb-rōṇ), a peninsula on the western coast of France, in the department of Morbihan, containing a market-town of the same name and several hamlets. The place owes its celebrity to the defeat of a small army of Chouans and émigrés which took place here in 1795.

Quibor (kē'bor), a town of Venezuela, in the State of Lara, division Barquisimeto. Pop. 7727.

Quichua (kē'chụ-â), the name of a native race of South America, inhabiting Peru, parts of Ecuador, Bolivia, etc. With the Aymaras the Quichuas composed the larger portion of the population of the empire of the Incas. The Quichua language, which was formerly the state language of the Incas, is still the chief speech of Peru, of a large portion of Bolivia, of the part of Ecuador bordering upon Peru, and of the northern section of the Argentine Republic. It is one of the most beautiful and at the same time comprehensive tongues of America.

Quick Grass, Quitch Grass, or Quickens See *Couch Grass.*

Quick Hedge, Quickset Hedge, an English term for a live hedge of any kind; but in a stricter sense the term is restricted to one planted with hawthorn.

Quicklime. See *Lime.*

Quicksand (kwik'sand), a large mass of loose or moving sand mixed with water formed on many seacoasts, and at the mouths of rivers, or at marshy inland places, dangerous to vessels or to persons who trust themselves to it and find it unable to support their weight.

Quicksilver. See *Mercury.*

Quietism (kwī'et-izm), a religious movement in the Roman Catholic Church at the close of the 17th and beginning of the 18th centuries, a protest against formality and worldliness, and largely of a mystic character. It owed its origin to such works as the *Spiritual Guide*, published at Rome (1675) by a Spanish priest named Michael Molinos, in which the devout were taught, by resigning themselves to a state of perfect mental inactivity, to bring the soul into direct and immediate union with the Godhead, and receive the infused heavenly light, which was to accompany this state of inactive contemplation. The *Spiritual Guide* produced a number of similar works in Germany and France. The most noted promoter of Quietism in France was the celebrated Madame Guyon (which see), who gained adherents enough to excite the attention of the clergy. Fénelon became the advocate of Madame Guyon and her writings in his *Explication des Maximes des Saints sur la Vie intérieure* (1697). Bossuet obtained (1699) a papal brief which condemned twenty-three positions from Fénelon's book as erroneous; but the humility with which the latter submitted deprived his enemies of the fruits of their victory; and it was the change in the spirit of the times and not violence that gradually buried Quietism in oblivion.

Quilimane (kil-i-mä'ne), a town in East Africa, in the Portuguese territory of Mozambique, unhealth-

ily situated about 15 miles above the mouth of a river of the same name (the northern branch of the Zambesi). It carries on a considerable trade in gold, ivory, wax, etc., and coal of good quality is reported to be plentiful. Pop. about 7000.

Quiller-Couch (kwil'er köch), Sir Arthur Thomas, an English novelist and essayist (1863-), born in Cornwall. He was on the staff of the *Speaker* till 1899. In 1897 he was commissioned to finish R. L. Stevenson's noved *St. Ives*. He was knighted in 1910. Among his works are *Dead Man's Rock*, *The Splendid Spur*, *Green Bays* (verses and parodies), *From a Cornish Window*, *Nicky Nan*, *Reservist*, *On the Art of Writing*, *The Ship of Stars*, *The White Wolf*, *Poison Island*, *True Tilda*, *Wandering Heath*, *Foe-Farrell*, etc. He wrote under the pen-name of 'Q.'

Quillota (kil-yō'tȧ), a town in Chile, in the province of Aconcagua, 23 miles northeast of Valparaiso. The copper mines in the vicinity are regarded as the richest in Chile. The town has suffered severely on different occasions from earthquakes. Pop. 9876.

Quills (kwilz), the large wing-feathers of birds, and in a narrower sense the shafts or barrels of these. Quills are still in some localities used for making pens, although they have been generally superseded by steel and other metals for this purpose. The best quills for pens are those of the swan, but goose-quills are commonly used. Crow-quills are used for fine writing and pen-and-ink drawing. (See *Pen.*) Quills are also used for making brushes, artificial flowers, imitative horse-hair work, and a number of other articles, and the feather ends have even been woven into fine tissues.

Quiloa (kēl'o-ȧ), or Kilwa, a seaport of East Africa on the Zanzibar coast. Pop. 6000.

Quilon (kwē-lōn'), a coast town in Madras, India, in the state of Travancore, 35 miles northwest of Trivandrum, the capital, with a considerable export trade. It has a barrack for European troops, a hospital, and an Episcopal church. Pop. 15,691.

Quilting (kwilt'ing), a method of sewing two pieces of silk, linen, or stuff on each other, with wool or cotton between them, by working them all over in the form of checker or diamond work, or in flowers.

Quimper (kaṇ-pār), a town and port in France, capital of the department of Finistère, 4 miles southeast of Brest, at the head of the estuary of the Odet, an old town partly surrounded with walls flanked by towers. The principal edifices are a fine Gothic cathedral (1239-1493); the ruins of a Cordelier church and cloister; the college, the prefecture, military hospital, etc. The manufactures are earthenware, leather, cordage, etc. The sardine fishery forms an important occupation. Pop. (1910) 21,051.

Quimperlé (kaṇ-pār-lā), a town of France, dep. Finistère, beautifully situated among hills at the confluence of the Isole and Ellé. Pop. 6093.

Quin (kwin), James, an eminent actor, of Irish parentage, born at London in 1693; died at Bath in 1766. He made his first appearance on the stage at Dublin in 1714; shortly afterwards he obtained an engagement in London, and gradually acquired celebrity as a tragic actor as well as in characters of comic and sarcastic humor, like *Falstaff*, *Volpone*, etc. He retained his preëminence until the appearance of Garrick in 1741. His last performance was *Falstaff* (1753), in which character he is supposed never to have been excelled. He spent his latter years at Bath, where his fund of anecdote and pointed wit made him much sought after.

Quince (kwins), the fruit of the *Cydonia vulgāris*, nat. order Rosaceæ. The quince tree, which is supposed to be a native of Western Asia, is now cultivated throughout Europe, and in many parts of the United States, for its handsome golden yellow fruit, which, though hard and austere when plucked

Quince (*Cydonia vulgaris*).

from the tree, becomes excellent when boiled and eaten with sugar, or preserved in sirup, or made into marmalade.

Quincey, Thomas de. See *De Quincey.*

Quincunx (kwin'kungks), an arrangement of five objects, especially trees, in a square, one at each corner of the square and one in the middle.

Quincy (kwin'si), a city, county seat of Adams Co., Illinois, on the Mississippi, here crossed by a bridge, 142 miles N. W. of St. Louis, on the Chicago, Burlington & Quincy, the Wabash, and the Quincy, Omaha & Kansas City railroads. It has many fine parks and boulevards, and is the site of the Illinois Soldiers and sailors' Home. It is an industrial and commercial center, has the largest cereal breakfast food mill in the world, and, among other things, makes more engine governors and pumps than any other city. Pop. (1910) 36,587; (1920) 35,978.

Quincy, a city of Norfolk Co., Massachusetts, on Quincy Bay, a suburb of Boston. It has granite quarries, shipbuilding yards, and various other interests. It is one of the oldest settlements in Massachusetts, dating back to 1625. Here John Adams, John Quincy Adams, and John Hancock were born. It was chartered as a city in 1888. Pop. (1910) 32,642; (1920) 47,876.

Quincy, JOSIAH, an American writer, born at Boston in 1772; died in 1864. Educated for the law, he made politics his profession, and was a member of Congress from 1804 to 1812. Then he was elected a member of the senate of the legislature of Massachusetts, a position which he held till 1821, in which year he held the office of Speaker of the House. From 1823 to 1828 he was mayor of Boston and effected various important reforms. From 1829 to 1845 he was president of Harvard College. His principal works are *History of Harvard University; Municipal History of the Town and City of Boston During Two Centuries;* and *Life of John Quincy Adams.*

Quinet (kē-nā), EDGAR, a French philosopher, poet, historian, and politician, born in 1803; died in 1875. He first attracted attention by a translation of Herder's *Philosophie der Geschichte* in 1825. In 1828 he accompanied a scientific commission to the Morea; and in 1839 he became professor of foreign literature at Lyons, a position he changed in 1841 for a similar chair in the College of France. In consequence of the strongly democratic tone of the lectures delivered there from 1843 to 1846 his class-room was in the latter year closed by the government, and was not reopened till after the revolution of 1848. After the election of Napoleon as president Quinet was expelled from France, and refusing all Napoleon's amnesties, his exile lasted till after the revolution of 1870. His works, which number about thirty volumes, include poems, dramas, histories, religious mystical books, etc.

Quinine (kwin'ēn, kwī'nīn; $C_{20}H_{24}N_2O_2$), a white, crystalline alkaloid substance, inodorous, very bitter, and possessed of marked antifebrile properties. It is obtained from the bark of several trees of the order Cinchonaceæ (see *Cinchona*), but perhaps the best is that from calisaya bark. It was discovered about 1820, and has entirely superseded the use of the bark itself in medicine, being most commonly used in the form of sulphate of quinine. The extraordinary value of quinine in medicine as a febrifuge and tonic has given rise to a large trade in Peruvian bark, and has caused the cinchona tree to be extensively planted in India and elsewhere. Quinine in small doses is stomachic, in large doses it causes extreme disturbance of the nerves, headache, deafness, blindness, paralysis, but seldom death.

Quinoa (kwi-nō'a), a South American plant (*Chenopodium Quinoa*), of which there are two cultivated varieties, one yielding white seeds, and sometimes called petty-rice, the other red. The white seeds are extensively used in Chile and Peru as an article of food in the form of porridge, cakes, etc. The seeds of the other variety, *red quinoa*, are used medicinally as an application for sores and bruises.

Quinquagesima (kwin-kwa-jes'i-ma), name of the Sunday before Lent, because fifty days before Easter.

Quinsy (kwin'zi), the common name for *cynanchē tonsillaris* or *tonsillitis*, inflammation of the tonsils. The inflammation is generally ushered in by a feeling of uneasiness in the part. The voice is thick, and there is often swelling of the glands of the neck, with loss of appetite, thirst, headache, and a considerable degree of general fever. The tonsils, uvula, and even the soft palate are swollen and vascular, and the tongue is foul and furred. In severe cases respiration is considerably impeded, and swallowing is always difficult and painful. The inflammation of the throat may terminate either in resolution or suppuration. The most frequent cause of quinsy is cold, produced by sudden changes of temperature. But in a great many cases it will be found that the patient has been predisposed to the disease, owing to a bad state of the digestive organs. The best treatment to ward off an attack is to administer a dose of some strong purgative saline medicine. Bland soothing drinks should be given during the course of the disease, and sucking small pieces of ice usually gives much relief.

Quintain (kwin'tan), a figure or other object formerly set up to be tilted at with a lance. It was constructed in various ways; a common form in England consisted of an upright post, on the top of which was a horizontal bar turning on a pivot; to one end of this a

Ancient Quintain at Offham, Kent.

sand-bag was attached, on the other a broad board; and it was a trial of skill to tilt at the broad end with a lance, and pass on before the bag of sand could whirl round and strike the tilter on the back.

Quintal (kwin'tal), a weight of 100 lbs. or thereby, used in different countries. The old French quintal was equal to 100 livres, or nearly 108 lbs. avoirdupois. The *quintal métrique*, or modern quintal, is 100 kilogrammes, or 220 lbs. avoirdupois.

Quintana (kin-tä'nȧ), Manuel José, a Spanish poet, born at Madrid in 1772; died in 1857. He studied at Cordova and Salamanca, became an advocate, and filled various offices connected with the government at different times. Almost all the manifestoes in the war against the French were composed by him; he also wrote a series of patriotic poems, entitled *Odas a España Libre*. He was eventually appointed director-general of education, and became a senator. His poetical, critical and historical works are held in high estimation.

Quintet (kwin-tet'; Italian, *quintetto*), a vocal or instrumental composition in five parts, in which each part is obligato, and performed by a single voice or instrument.

Quintilian (kwin-til'yan), Marcus Fabius Quintilianus, a Roman rhetorician, born at Calagurris (Calahorra) in Spain, probably between 35 and 40 A.D.; died about 118. He began to practice as an advocate at Rome about A.D. 69, and subsequently became a teacher of rhetoric. Some of the most eminent Romans were his pupils, and the Emperor Domitian bestowed on him the consular dignity. His work, *De Institutione Oratoria*, contains a system of rhetoric in twelve books, and includes some important opinions of Greek and Roman authors.

Quintus Cal'aber, or Smyrnæ'us, a Greek poet, author of a sort of continuation of the *Iliad* in fourteen books, a rather dull imitation of Homer. He probably flourished at Smyrna in the 4th century A.D.

Quintus Curtius. See *Curtius*.

Quipo, Quipu (kwip'o, kwip'ö), a cord about 2 feet in length, tightly spun from variously colored threads, and to which a number of smaller threads were attached in the form of a fringe: used among the ancient Peruvians and Mexicans for recording events, etc. The fringe-like threads were also of different colors. and were knotted. The colors denoted sensible objects, as white for silver, yellow for gold, and the like; and sometimes also abstract ideas, as white for peace, red for war. They constituted a rude register of certain important facts or events, as of births, deaths, and marriages, the number of the population fit to bear arms, the quantity of stores in the government magazines, etc.

Quire (kwīr; French, *cahier*), twenty-four sheets of paper. Twenty quires make a *ream*.

Quirinal (kwir'i-nal), one of the seven hills of ancient Rome. There is a palace here, begun in 1574, and formerly a summer re idence of the popes, but since 1871 the residence of the king of Italy. See *Rome*.

Quirinus (kwi-rī'nus), among the Romans, a surname of Romulus after he had been raised to the rank of a divinity. Hence *Quirinalia*, a festival in honor of Romulus, held annually on the 13th day before the Kalends of March, that is, the 17th of February.

Quirites (kwi-rī'tēz), a designation of the citizens of ancient Rome as in their civil capacity. The name of Quirites belonged to them in addition to that of Romani, the latter designation applying to them in their political and military capacity.

Quirk Molding, or Quirked Molding, in architec-

ture, a molding whose sharp and sudden return from its extreme projection to the re-entrant angle seems rather to partake of a straight line on the profile than of the curve.

Quit-claim, in law, signifies a release of any action that one person has against another. It signifies also a quitting of a claim or title to lands, etc.

Quito (kē'tō), the capital of Ecuador, in a ravine on the east side of the volcano of Pichincha, 9348 feet above the sea, a little to the south of the equator. Its streets, with exception of four which meet in the large central square, are narrow, uneven, badly paved, and extremely dirty. The more important public buildings are the cathedral, several other churches and convents; the town-house, court-house, president's palace, the university, the episcopal palace, orphan asylum, and hospital. The manufactures consist chiefly of woolen and cotton goods. From the want of good roads and railways trade is much hampered. Quito was originally the capital of a native kingdom of the same name, but the modern town was founded by the Spaniards in 1534. It has repeatedly suffered from earthquakes. Pop. (1915) est. at 70,000, largely consisting of half-breeds and Indians.

Quit-rent, in English law, a small rent generally payable by the tenants of manors, whereby the tenant goes quit and free from all other services. Quit-rents still existing are redeemable by law.

Quittah (kwit'ta), a town on the coast of W. Africa, in the British colony of the Gold Coast. Pop. 5000.

Quoin (koin), in artillery, a wedge inserted under the breach of a gun, for raising or depressing the muzzle. In architecture, one of the stones forming the solid corner of a building.

Quoits (kwoitz), a game played with a flattish ring of iron, generally from 8¼ to 9½ inches in external diameter, and between 1 and 2 inches in breadth. It is convex on the upper side and slightly concave on the under side, so that the outer edge curves downwards, and is sharp enough to cut into soft ground. The game is played in the following manner: — Two pins, called hobs, are driven into the ground from 18 to 24 yards apart; and the players, who are divided into two sides, stand beside one hob, and in regular succession throw their quoits (of which each player has two) as near the other hob as they can, giving the quoit an upward and forward pitch with the hand and arm, and at same time communicating to it a whirling motion so as to make it cut into the ground. The side which has the quoit nearest the hob counts a point towards game, if the quoit rests on the hob it counts two, if thrown so as to 'ring' the hob, it counts three.

Quorra (kwor'ra), a name given to the lower portion of the Niger (which see).

Quorum (kwō'rum), a term used in commissions, of which the origin is the Latin expression, *quorum unum A. B. esse volumus* ('of whom we will that A. B. be one'), signifying originally certain individuals, without whom the others could not proceed in the business. In legislative and similar assemblies a quorum is such a number of members as is competent to transact business.

Quotidian Fever. See *Ague.*

Quo Warranto, the name of a writ summoning a person or corporation to show by what right a particular franchise or office is claimed. In the rights of Charles II and James II this writ was used oppressively to deprive cities and boroughs of their liberties.

R

R is the eighteenth letter of the English alphabet, classed as a liquid and semi-vowel. In the pronunciation of Englishmen generally it represents two somewhat different sounds. The one is heard at the beginning of words and syllables, and when it is preceded by a consonant; the other, less decidedly consonantal, is heard at the end of words and syllables, and when it is followed by a consonant. In the pronunciation of many English speakers, *r*, followed by a consonant at the end of a syllable, is scarcely heard as a separate sound, having merely the effect of lengthening the preceding vowel; when it is itself final, as in *bear*, *door*, *their*, etc., it becomes a vowel rather than a consonant.— *The three Rs*, a humorous and familiar designation for *Reading*, *Writing*, and *Arithmetic*. It originated with Sir William Curtis, who, on being asked to give a toast said, 'I will give you *the three Rs*, *Riting*, *Reading*, and *Rithmetic*.'

Ra (more properly RÊ), the name of the god of the sun among the ancient Egyptians. He is represented, like Horus, with the head of a hawk, and bearing the disk of the sun on his head. *Tum*, *Harmachis*, and other gods are mere impersonations of the various attributes of Ra.

Raab (räb), or GYÖR (dy*eur*), a town in Hungary, at the confluence of the Raab and Rabnitz with the Danube, 67 miles W.N.W. of Buda. It is the see of a Roman Catholic bishop, and has a fine cathedral, an episcopal palace, diocesan seminary, etc. Its manufactures are woolen cloth, cutlery, and tobacco. Pop. 27,738.

Rabat (rä-bät'), a maritime town in Morocco, in the province of Fez, on the Atlantic, at the mouth of the Buregreb, is surrounded with a wall flanked by numerous towers, and has a citadel and batteries. It has some manufactures (carpets, woolens, cottons, and leather) and considerable trade in wool and corn. Pop. about 35,000. On the other side of the river mouth is the town of Sallee.

Rabba (råb'bå), a town of the Western Soudan, in the Kingdom of Gando, on the left bank of the Niger, some 350 miles from its mouth, formerly populous and with a considerable trade in slaves and ivory, and manufactures of woolen.

Rabbet (rab'et), in carpentry, a sloping cut made on the edge of a board so that it may join by lapping with another board similarly cut; also, a rectangular recess, channel, or groove cut along the edge of a board or the like to receive a corresponding projection cut on the edge of another board, etc., required to fit into it.

Rabbi (rab'i), a title of honor among the Hebrews, corresponding nearly to the English *master*. There are two other forms of the title, *rabboni* and *rabbani*, the former of which is found in the New Testament. It is supposed that this title first came into use at the period immediately preceding the birth of Christ. In the time of our Lord it was applied generally to all religious teachers, and hence sometimes to Christ himself. Now the term rabbi or rabbin is applied to regularly appointed teachers of Talmudic Judaism.

Rabbinic Hebrew (ra-bin'ik), that form of Hebrew in which the Jewish scholars and theologians of the middle ages composed their works. Grammatically it differs but little from the ancient Hebrew, but in many cases new meanings are attached to Hebrew words already in use, in other cases new derivatives are formed from old Hebrew roots, and many words are borrowed from the Arabic. The rabbinical literature is rich and well repays study.

Rabbit (rab'it; *Lepus cunicŭlus*), a genus of rodent mammals, included in the family Leporidæ, to which also belong the hares. It is of smaller size than the hare, and has shorter ears and hind legs. The rabbit's fur in its native state is of a nearly uniform brown color, while under domestication the color may become pure white, pure black,

piebald, gray, and other hues. The texture of the fur also changes under domestication. The rabbit is a native of all temperate climates, and in its wild state congregates in 'warrens' in sandy pastures and on hill-slopes. Rabbits breed six or seven times a year, beginning at the age of six months, and producing from five to seven or eight at a birth. They are so prolific that they may easily become a pest, as in Australia, if not kept in check by beasts and birds of prey. They feed on tender grass and herbage, and sometimes do great damage to young trees by stripping them of their bark. They grow exceedingly tame under domestication, and sometimes exhibit considerable intelligence. Rabbits are subject to certain diseases, such as rot — induced probably by damp and wet — parasitic worms, and a kind of madness. The skin of the rabbit is of considerable value; cleared of hair, it is used with other skins to make glue and size. The fur is employed in the manufacture of hats, and to imitate other and more valuable furs, as ermine, etc.

Rabelais (rȧb-lā), FRANÇOIS, a humorous and satirical French writer, born in or before 1495, the son of an apothecary of Chinon, in Touraine. He entered the Franciscan order at Fontenay-le-Comte, in Poitou and received the priesthood. His addiction to profane studies appears to have given offense to his monastic brethren, and through the influence of friends he obtained the permission of Clement VII to enter the Benedictine order (about 1524). He then exchanged the seclusion of the monastery for the comparative freedom of the residence of the Bishop of Maillezais, who made him his secretary and companion. In the course of a few years we find him at Montpellier, where he studied medicine, having by this time become a secular priest; he was admitted a bachelor in 1530, and for some time successfully practiced and taught. In 1532 he went to Lyons, where he published a work of Hippocrates and one of Galen, and the first germ of his *Gargantua* (1532 or 1533). The first part of his *Pantagruel* appeared under the anagram of *Alcofribas Nasier*, within a year or so after the former work, and its success was such that it passed through three editions in one year. Soon after its publication Rabelais accompanied Jean du Bellay on an embassy to Rome. On his return to France he went first to Paris; but not long after he is found once more at Lyons, where the *Gargantua*, as we now have it, first saw the light (1535). The *Gargantua* and *Pantagruel* together form a single work professing to narrate the sayings and doings of the giant Gargantua and his son Pantagruel. In 1536 Rabelais was again at Rome, and on this occasion he obtained from the pope absolution for the violation of his monastic vows, and permission to practice medicine and to hold benefices. Shortly afterwards he was granted a prebend in the abbey of Saint Maur-des-Fossés by Jean du Bellay. In 1537 he took his degree of Doctor of Medicine at Montpellier, and lectured on Hippocrates. The next few years were as unsettled as regards his abode as any previous period of Rabelais' life, and it is difficult to follow him. Probably he was in Paris in 1546, when the third book of his *Gargantua and Pantagruel* appeared, but during most of 1546 and part of 1547 he was physician to the town of Metz. In the third book all the great moral and social questions of the day were discussed with the gayety and irony peculiar to Rabelais, and with a freedom that roused the suspicion of the clergy, who endeavored to have it suppressed. The favor of the king secured its publication, but it was with more difficulty that a license was obtained for the fourth book from Henry II, who had succeeded Francis in 1547. This book did not appear complete till 1552. About 1550 Rabelais was appointed to the cure of Meudon, but he resigned the position in 1552, and died a year later, according to most authorities. He left the whole of the fifth book of his remarkable romance in manuscript. By many Rabelais has been set down as a gross buffoon, and there is much in his writings to justify the harsh judgment, though we must remember what was the taste of his times. As regards the purpose of his work, many have looked upon Rabelais as a serious reformer of abuses, religious, moral, and social, assuming an extravagant masquerade for the purpose of protecting himself from the possible consequences of his assaults on established institutions. The earlier books were translated into English by Sir Thomas Urquhart (1653), who found a continuator in Motteux. There are also translations into German and Italian.

Rabies (rā′bi-ēz), the name given to a contagious disease with which dogs, horses, cats, wolves, and other animals are attacked, and to which, indeed, all animals are said to be liable. A bite from some rabid animals induces hydrophobia in man. See *Hydrophobia*.

Racalmuto (rä-kȧl-mö′tō), a town of Sicily, in the prov-

ince of Girgenti, with mines of sulphur, salt, and quicksilver. Pop. 15,938.

Raccahout (rak'ka-hŏt), a starch or meal prepared from the edible acorn of the Barbary oak (*Quercus Ballōta*), recommended as food for invalids. Mixed with sugar and aromatics it is used by the Arabs of Northern Africa as a substitute for chocolate.

Race-horse, a horse bred or kept for racing or running in contest, called also a *Blood-horse* and a *Thorough-bred Horse*. Racing has long been practiced in Europe, with the result of greatly developing the speed of the horse. The racing horse is of three types, running, pacing and trotting. The running race has for centuries held a dominant place in the sports of England and Europe. The favorite pace in America is the trot, and horses of this type are in great demand in this country, and since 1870 have become popular abroad. The speed of trotting horses, from the earliest known record in 1818, has shown a steady improvement as a result of careful breeding and training. The horse goes into training in its second year and requires expert care for its successful development. The following records show the gradual increase in speed during the last century over the one mile course: 1826, Trouble, 2.43; 1839, Dutchman, 2.32; 1859, Flood Temple, 2.19¾; 1892, Nancy Hanks, 2.04; 1903, Lou Dillon, 1.58½; 1912, Uhlan, 1.58. It is estimated that it will take two centuries to reach the 1.30 mark.

Rachel (rå-shell), Mademoiselle (Elizabeth Rachel Felix), a French *tragédienne*, of Jewish extraction, born in 1821; died in 1858. For a time she gained her living by singing in the streets of Lyons, but being taken notice of she was enabled to receive a course of instruction at the Conservatoire, and made her *début* in 1837 on the stage of the Gymnase at Paris. She attracted no special attention, however, until the following year, when, transferred to the Théâtre Français, she took the Parisian public by storm by the admirable manner in which she impersonated the classic creations of Racine and Corneille. Her reputation was speedily established as the first tragic actress of her day. In 1841 she visited England, and was received with the greatest enthusiasm. Her renown continued to increase, and for many years she reigned supreme at the Théâtre Français, making also tours to the provincial towns of France, to Belgium, etc. Later she visited America, but when there caught a severe cold, which terminated in consumption. She was of a fierce and unlovable temper, destitute of moral principle, and very avaricious.

Rachis (rā'kis), in botany, a branch which proceeds nearly in a straight line from the base to the apex of the inflorescence of a plant. The term is also applied to the stalk of the frond in ferns, and to the common stalk bearing the alternate spikelets in some grasses.

Rachitis (ra-kī'tis), a term which properly implies inflammation of the spine, but it is applied to the disease called *Rickets*, which term suggested this as the scientific name.

Rachmaninof (räk-män'ē-nof), Sergei Vassilievitch, a Russian pianist and composer, born in Novgorod, April 2, 1873. He visited London in 1899, and America in 1909–10. His works include concertos and pianoforte pieces and several operas.

Racine (ra-sēn'), a city, county seat of Racine Co., Wisconsin, the second largest city in the State, 62 miles N. of Chicago, on Lake Michigan, and on main lines of Chicago Northwestern and Chicago, Milwaukee & St. Paul railways. It has an excellent harbor and boat lines connecting with Great Lakes points. Over 200 different classes of products are manufactured here. Pop. (1910) 38,002; (1920) 58,593.

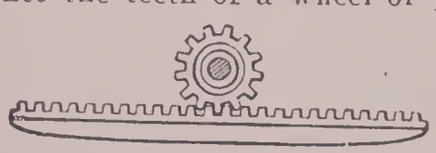
Racine (rå-sēn), Jean Baptiste, a distinguished French dramatist, born at La Ferté-Milon (Aisne) in 1639; died at Paris in 1699. He was educated at Port-Royal, the famous Jansenist institution, and at the Collège d'Harcourt. His first tragedy, the *Thébaïde*, or *Les Frères Ennemis*, was performed by Molière's troupe at the Palais-Royal in 1664, as was also his next *Alexandre*, in 1665. His first masterpiece was *Andromaque*, which on its performance at the Hôtel de Bourgogne, in 1667, produced a profound impression. The immediate successor of *Andromaque* was *Les Plaideurs* (1668), a witty and delightful imitation of the *Wasps* of Aristophanes. His succeeding pieces were *Britannicus* (1669); *Bérénice* (1670); *Bajazet* (1672); *Mithridate* (1673); *Iphigénie* (1674); *Phèdre* (1677), the last piece that Racine produced expressly for the theater. In 1673 he obtained a seat in the French Academy. His withdrawal from the theater in 1677 was partly due to chagrin at the success of a hostile group of theatrical critics. At this period his friends persuaded him to marry, and soon after (1678) he was appointed, along with Boileau, historiographer to the king, whom he accompanied in his campaign to Flanders. After a silence of twelve years

Racine, at the solicitation of Madame de Maintenon, wrote two other pieces — *Esther* (1689) and *Athalie* (1691). His death is said to have been hastened by grief at losing the favor of the king. As a dramatist Racine is usually considered the model of the French classical tragic drama, and in estimating his powers in this field it is necessary to take into account the stiff conventional restraints to which that drama is subjected. What he achieved within these limits is extraordinary. Besides his dramas Racine is the author of epigrams, odes, hymns, etc.

Racing (ras'ing). See *Horse-racing.*

Rack (rak), an instrument for the judicial torture of criminals and suspected persons. It was a large open wooden frame within which the prisoner was laid on his back upon the floor, with his wrists and ankles attached by cords to two rollers at the end of the frame. These rollers were moved in opposite directions by levers till the body rose to a level with the frame; questions were then put, and if the answers were not deemed satisfactory the sufferer was gradually stretched till the bones started from their sockets. It was formerly much used by civil authorities in the cases of traitors and conspirators; and by the members of the Inquisition, for extorting a recantation from imputed heretical opinions. The rack was introduced into England in the reign of Henry VI, and although declared by competent judges to be contrary to English law, there are many instances of its use as late as the time of Charles I.

Rack, in machinery, a straight or slightly curved metallic bar, with teeth on one of its edges, adapted to work into the teeth of a wheel or pinion,



Rack and Pinion.

for the purpose of converting a circular into a rectilinear motion, or vice versa.

Rackets, or RACQUETS (rak'ets), a game played in a prepared court, open or close, with a small hard ball and a bat like that used for playing tennis. The close or roofed court is now generally preferred for playing in. It is an oblong rectangular area, 80 feet long and 40 broad when of full dimensions, and having high walls. The floor is divided into two chief areas of unequal size by a line, called the *short line*, drawn across it at two-fifths of the length of the court from the back wall, the smaller area being again divided into two equal parts by a line at right angles to this, and two small areas being marked off in the other space next the short line, called *service spaces*. Two horizontal lines are also drawn across the front wall, one 2 feet 2 inches above the floor, below which if a ball strike it is out of play, the other, the *cut line*, 7 feet 9 inches above the floor. The game may be played with either one or two persons on each side. It is decided by lot which side goes in first, and the first player assumes which side of the court he pleases (usually the right), while the other stands in the opposite corner. The first player then begins to *serve*, which consists in striking the ball with the bat so as to make it strike the front wall above the cut line, and then rebound into the opposite corner. If the ball is properly served the second player must strike it before it has made a second bound, so that it strikes the front wall above the lower line; but in returning the ball in this manner the player may if he likes first make it strike either of the side walls. The player may also return it before it touches the floor. The first player then returns the ball in the same way, and this goes on until either player fails. If it is the first player who fails, it is then the turn of the second player to serve. If it is the second player, the first scores one (an ace), and continues to serve, but goes to the opposite side of the court. In general fifteen is game.

Racoon, or RACCOON (ra-kön'), an American plantigrade carnivorous mammal, the common raccoon being the *Procyon lotor*. It is about the size of a small fox, and its grayish-brown fur is deemed valuable, being principally used in the manufacture of hats. This animal lodges in hollow trees, feeds occasionally on vegetables, and its flesh is

Common Raccoon (*Procyon lotor*).

palatable food. It inhabits North America from Canada to the tropics. The black-footed raccoon of Texas and California is *P. Hermandesii*. The agouara or crab-eating raccoon (*P. cancrivŏrus*) is found further south on the American continent than the above species, and is

generally larger. Although denominated 'crab-eating' it does not appear to be any more addicted to this dietary than the common species.

Radautz (rä'douts), a town of Austria, in the duchy of Bukowina, with a government stud of horses and manufactures of machinery, glass, paper, beer, and spirits. Pop. 14,403.

Radcliffe (rad'klif), a town in Lancashire, on the river Irwell, 7 miles N. W. of Manchester and 3 S. W. of Bury; does a considerable business in calico-printing, cotton-weaving, bleaching, etc., and has extensive collieries in its vicinity. Pop. (1911) 26,085.

Radcliffe, ANN WARD, novelist, was born in London in 1764; died in 1823. She married at the age of twenty-three Mr. William Radcliffe, afterwards editor and proprietor of the *English Chronicle* newspaper. She published in quick succession *The Castles of Athlin and Dunbayne*, a Highland story; *The Sicilian Romance;* and *The Romance of the Forest.* Her masterpiece is considered to be the *Mysteries of Udolpho* (1794), which was long very popular. The last of her novels published during her life was *The Italian* (1797). A posthumous romance, *Gaston de Blondeville*, was edited by T. N. Talfourd in 1826, together with some poetical pieces. Mrs. Radcliffe had considerable power in description, and knew how to arouse the curiosity of her readers; but her characters are insipid, and the conclusion of her stories lame and impotent.

Radcliffe, JOHN, a celebrated medical practitioner, born in 1650 at Wakefield, in Yorkshire, and educated at Oxford. Having studied medicine, and taken the degree of M.B., he became in 1686 physician to the Princess Anne of Denmark, and was frequently consulted by King William. He attended Queen Mary in 1694 when she was attacked by small-pox, but was unable to save her. Rough and blunt in manner, he lost the good graces of Anne, and also of William, by his plain speaking. In 1714, when the queen was seized with her last illness, he was sent for, but either could not or would not attend. This gave rise to great ill-feeling towards him. He died in 1714, leaving £40,000 to the University of Oxford for the foundation of a library of medical and philosophical works. See *Radcliffe Library.*

Radcliffe College. See *Harvard University.*

Radcliffe Library, a library founded in connection with Oxford University out of funds destined for the purpose by Dr. John Radcliffe, and opened in 1749. The building erected by the Radcliffe trustees for the reception of the books forming the library is now used as a reading-room in connection with the Bodleian Library. An observatory in connection with the university was founded in 1772 by the Radcliffe trustees.

Radeberg (rä'dė-ber*h*), a town in Saxony, 9 miles N. E. of Dresden, on the Roeder; has important manufactures of glass, paper, etc. Pop. (1905) 13,301

Radetzky (ra-det'skē), JOSEPH WENCESLAUS, COUNT, a famous Austrian soldier, born at Trebnitz, in Bohemia, in 1766; died in 1858. Commencing his career in a Hungarian regiment of horse in 1784, he fought in most of the campaigns in which Austria was engaged from that date up to the time of his death, including Hohenlinden, Wagram, and Leipzig. But his most signal services were in Italy, whither he was called by the commotions following the French revolution of 1830, and where a great part of his subsequent life was spent. On the breaking out of the insurrection at Milan in March, 1848, Radetzky maintained a fight for several days in the streets, and then retreated with his forces to Verona. On the Sardinian king Charles Albert taking the field he assumed the offensive, and after an arduous, and for a time doubtful, campaign gained the victory of Custozza (July 25), which compelled Charles Albert to retreat to Milan, and then evacuate the city after a short contest, thus preserving Lombardy to Austria. An armistice having been concluded with Sardinia he next occupied himself with the blockade of the revolted city of Venice, but hurried from it in March, 1849, on the resumption of hostilities with Charles Albert. Assembling his army at Pavia he crossed the Ticino, and gained so decisive a victory at Novara, on March 23, that the king abdicated in favor of his son, Victor Emmanuel, and a treaty was concluded which secured for the time the Austrian supremacy in Italy. Venice surrendered to Radetzky in August of the same year. Radetzky had been made field-marshal in 1836, and other honors and rewards were now showered upon him. The remainder of his life was spent at Milan.

Radhanpur (räd'hun-pör), a petty state of British India, in the N. W. of Gujerat, with an area of 1150 square miles. The state came under British protection in 1819. Pop. 61,548.— The capital of the state has the same name. Pop. 11,879.

Radiata (rā-di-ā′ta), the name given by Cuvier to the fourth great division of the animal kingdom, including those animals whose parts are arranged round an axis, and display more or less of the 'rayed' appearance or conformation. In modern zoology Cuvier's division has been abolished, and the radiata have been divided into the Protozoa, Cœlenterata, and Annuloida or Echinozoa.

Radiation. See *Heat.*

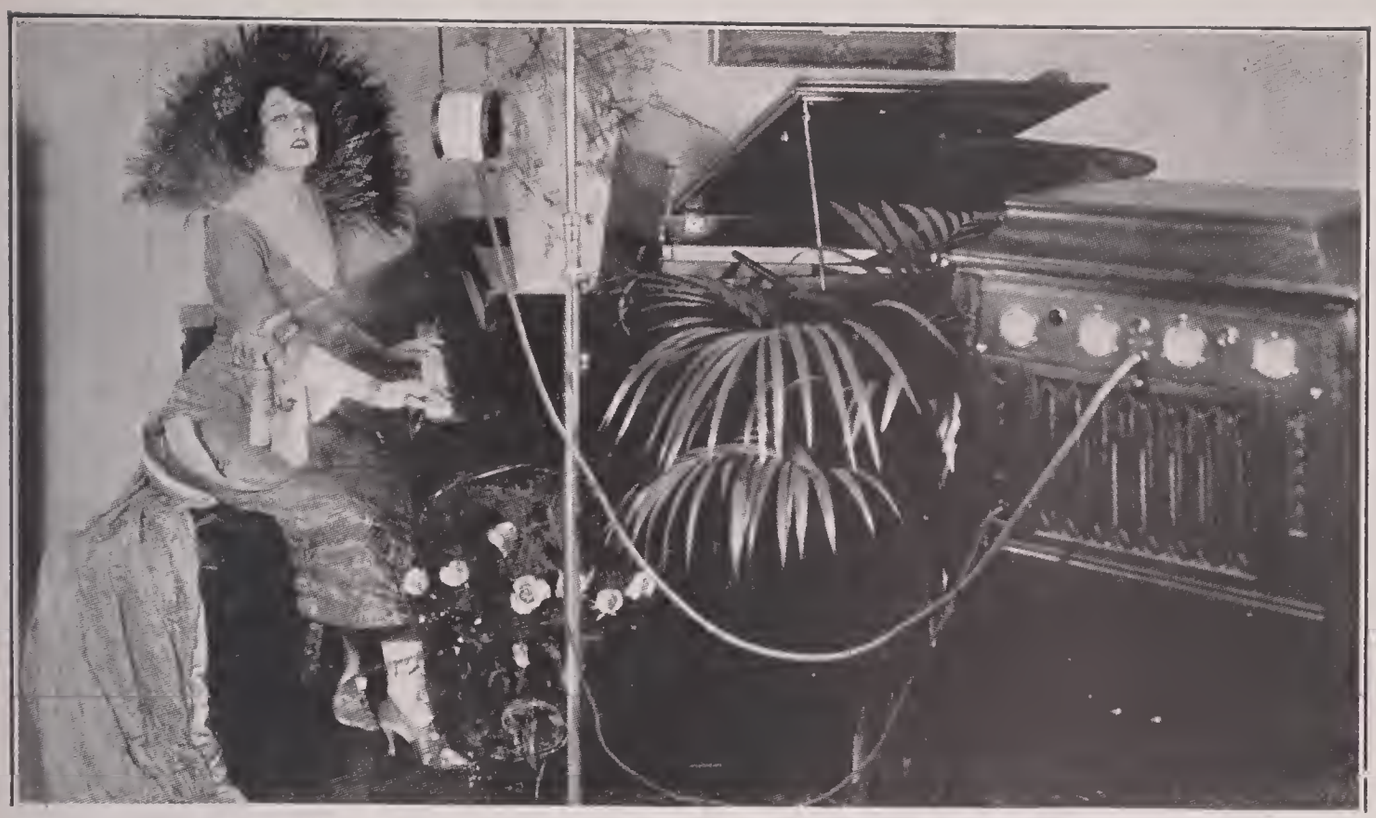
Radical (rad′i-kal; from *L. radix*, root), a person who holds extreme views. (See also *Chemistry.*)

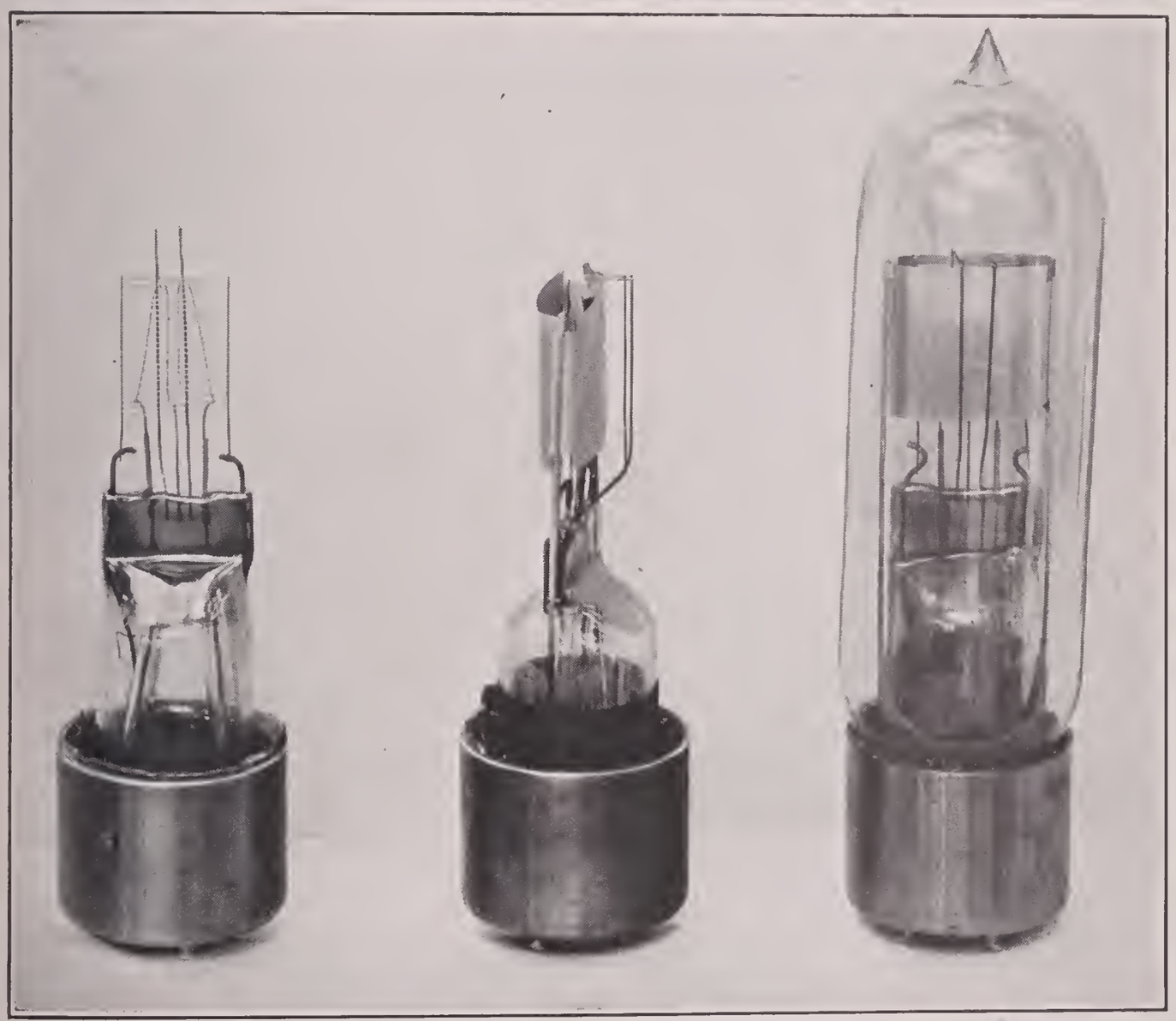
Radio (rā′di-ō), a general name for wireless, applied more particularly to wireless telephony. (For general description of wireless telegraphy see *Wireless.*) The radio telephone is a development of the older radio telegraph or wireless telegraph, and by means of it speech and other sounds are transmitted instead of the dots and dashes of the telegraph code. So far as the fundamental principles of operation are concerned, the radio telephone and telegraph are closely related. Their chief difference resides in the form in which energy is radiated. In radio telephony it is finely molded to correspond to the sounds to be transmitted, whereas in wireless telegraphy it is simply chopped up into lumps to form dots and dashes.

The first important development in the art of transmitting the voice through the ether without wires was the invention of Dr. Lee De Forest of the remarkable device called the 'audion.' At the sending station it amplifies the feeble voice effects until they can be heard for distances as great as 7000 miles; and at the receiving station it magnifies the very minute currents picked up by the antenna or aerial. Of no less importance was the application of the audion by Edwin H. Armstrong in 1914 to generate the currents of very high frequencies required for producing the electric waves used in radio telephony. The wave length is simply the distance from the beginning of one wave to the beginning of the next, and has nothing whatever to do with the distance covered. Different waves have been assigned various stations to prevent interference as much as possible. Radio waves travel at a uniform velocity—that of light—namely, 300,000,000 metres a second. Knowing the velocity and the wave-length, finding the frequency, or the number of waves per second, is simply a matter of division—the former by the latter. From that we make the inference that the longer the wave length the lower the frequency, and vice versa.

With these two basic inventions, the research laboratories of the navy and army and of a number of individuals and commercial concerns like the Westinghouse and the General Electric companies have brought the radiophone to its present stage of development and made a thoroughly practical instrument of it, by means of which concerts, lectures, market reports, children's stories, etc., are broadcasted throughout the country. In April, 1922, there were 75 broadcasting stations in the United States. In less than six months approximately 500,000 radio receiving sets were sold.

A receiving set consists of the antenna or aerial, the tuner, the detector and the telephone receivers. The *antenna*, or aerial, is a wire or wires suspended in the air and insulated from all surrounding objects, being a part of the electrical system by which the electro-magnetic waves are sent or received. The wire leading from the aerial to the apparatus is called the *lead-in*, and an electrical connection is made from the receiving set to the *ground*, which may be a water pipe or similar good conductor to the earth. This completes the electrical circuit. The *tuner* may be either a simple induction coil with taps taken off every few turns to a switch to vary the inductance, a more elaborate coil with both taps and sliders for finer adjustment or a device such as the variometer or the vario-coupler in which a spherical coil mounted on a shaft within another coil can be rotated to increase or diminish the inductance. A variable condenser is usually a part of the tuner and by the proper adjustment of these instruments the wave length of the receiving set may be tuned to that of the station it is desired to receive. The *detector* is a device for rectifying or making audible the electro-magnetic waves carrying voice or telegraph signals in the telephone receiver. Various types of detectors are employed. Those principally used are the crystal type in which the current is led through a crystal of some mineral possessing rectifying qualities such as galena, and the vacuum tube or audion detector which consists of a special form of incandescent lamp containing three elements, a grid, a filament and a plate. This is the most sensitive form of detector and is from ten to thirty times more efficient than the crystal, although the latter requires no battery and is cheaper in first cost. The vacuum tube possesses strong amplifying qualities





Courtesy of the Radio Corporation of America.

RADIO BROADCASTING AND THE VACUUM TUBE WHICH MADE IT POSSIBLE

The three element vacuum tube which is chiefly responsible for the rapid development of radio communication. The first view on the left shows the filament surrounded by the grid. In the center view the plate has been added and on the right is the complete tube. *Above.* A famous opera star at a radio broadcasting station singing to the invisible audience.

INTERNATIONAL MORSE CODE AND CONVENTIONAL SIGNALS

TO BE USED FOR ALL GENERAL PUBLIC SERVICE RADIO COMMUNICATION

1. A dash is equal to three dots.
2. The space between parts of the same letter is equal to one dot.
3. The space between two letters is equal to three dots.
4. The space between two words is equal to five dots.

A . —	R . — .	Ñ (Spanish) — — . — —
B — . . .	S . . .	
C — . — .	T —	Ö (German) — — — .
D — . .	U . . —	
E .	V . . . —	Ü (German) . . — —
F . . — .	W . — —	
G — — .	X — . . —	
H	Y — . — —	1 . — — — — —
I . .	Z — — . .	2 . . — — — —
J . — — —		3 . . . — — —
K — . —	Ä (German) . — . —	4 . . . . —
L . — . .	Å or Å (Spanish-Scandinavian) . — — . —	5 . . . . .
M — —		6 — . . . .
N — .		7 — — . . .
O — — —	CH (German-Spanish) — — — —	8 — — — — . .
P . — — .		9 — — — — — .
Q — — . —	É (French) . . — . .	0 — — — — — —

Period	. . . . .
Semicolon	— . — . — .
Comma	. — . — . —
Colon	— — — . . .
Interrogation	. . — — . .
Exclamation point	— — . . — —
Apostrophe	. — — — — .
Hyphen	— . . . —
Bar indicating fraction	— . . — .
Parenthesis	— . — — . —
Inverted commas	. — . . — .
Underline	. . — — . —
Double dash	— . . . —
Distress Call	. . . — — — — . . .
Attention call to precede every transmission	— . — . —
General inquiry call	— . — . — — — . —
From (de)	— . . .
Invitation to transmit (go ahead)	— . —
Warning—high power	— — . — —
Question (please repeat after . . . . .)—interrupting long messages	. . — — . .
Wait	. — . . .
Break (Bk.) (double dash)	— . . . —
Understand	. . . — .
Error	. . . . .
Received (O. K.)	. — .
Position report (to precede all position messages)	— . — .
End of each message (cross)	. — . — .
Transmission finished (end of work) (conclusion of correspondence)	. . . — . —

Abbreviation.	Question.	Answer or Notice.
C Q	— . — . — — — . —	Signal or enquiry made by a station desiring to communicate.
T R	— . — .	Signal announcing the sending of particulars concerning a station on shipboard (Art. XXII).
(!)	— — — . . — — —	Signal indicating that a station is about to send at high power.
PRB	Do you wish to communicate by means of the International Signal Code?	I wish to communicate by means of the International Signal Code.
QRA	What ship or coast station is that?	This is .....
QRB	What is your distance?	My distance is .....
QRC	What is your true bearing?	My true bearing is ..... degrees.
QRD	Where are you bound for?	I am bound for .....
QRF	Where are you bound from?	I am bound from .....
QRG	What line do you belong to?	I belong to the ..... Line.
QRH	What is your wave length in meters?	My wave length is ..... meters.
QRJ	How many words have you to send?	I have ..... words to send.
QRK	How do you receive me?	I am receiving well.
QRL	Are you receiving badly? Shall I send 20?	I am receiving badly. Please send 20.
	. . . — . for adjustment?	. . . — . for adjustment.
QRM	Are you being interfered with?	I am being interfered with.
QRN	Are the atmospherics strong?	Atmospherics are very strong.
QRO	Shall I increase power?	Increase power.
QRP	Shall I decrease power?	Decrease power.
QRQ	Shall I send faster?	Send faster.
QRS	Shall I send slower?	Send slower.
QRT	Shall I stop sending?	Stop sending.
QRU	Have you anything for me?	I have nothing for you.
QRV	Are you ready?	I am ready. All right now.
QRW	Are you busy?	I am busy (or, I am busy with .....). Please do not interfere.
QRX	Shall I stand by?	Stand by. I will call you when required.
QRY	When will be my turn?	Your turn will be No. .....
QRZ	Are my signals weak?	Your signals are weak.
QSA	Are my signals strong?	Your signals are strong.
QSB	Is my tone bad? Is my spark bad?	The tone is bad. The spark is bad.
QSC	Is my spacing bad?	Your spacing is bad.
QSD	What is your time?	My time is .....
QSF	Is transmission to be in alternate order or in series?	Transmission will be in alternate order.
QSG		Transmission will be in series of 5 messages.
QSH		Transmission will be in series of 10 messages.
QSJ	What rate shall I collect for .....?	Collect .....
QSK	Is the last radiogram canceled?	The last radiogram is canceled.
QSL	Did you get my receipt?	Please acknowledge.
QSM	What is your true course?	My true course is ..... degrees.
QSN	Are you in communication with land?	I am not in communication with land.
QSO	Are you in communication with any ship or station (or: with .....)?	I am in communication with ..... (through .....).
QSP	Shall I inform ..... that you are calling him?	Inform ..... that I am calling him.
QSQ	Is ..... calling me?	You are being called by .....
QSR	Will you forward the radiogram?	I will forward the radiogram.
QST	Have you received the general call?	General call to all stations.
QSU	Please call me when you have finished (or: at .... o'clock)?	Will call when I have finished.
QSV*	Is public correspondence being handled?	Public correspondence is being handled. Please do not interfere.
QSW	Shall I increase my spark frequency?	Increase your spark frequency.
QSX	Shall I decrease my spark frequency?	Decrease your spark frequency.
QSY	Shall I send on a wave length of ..... meters?	Let us change to the wave length of ..... meters.
QSZ		Send each word twice. I have difficulty in receiving you.
QTA		Repeat the last radiogram.
QTE	What is my true bearing?	Your true bearing is ... degrees from ...
QTF	What is my position?	Your position is ... latitude ... longitude.

* Public correspondence is any radio work, official or private, handled on commercial wave lengths

when used in a regenerative or feed-back circuit. With this type of detector it is possible to add an amplifier consisting of amplifying transformers and amplifier tubes in as many steps as desirable. Fixed and variable *condensers* are used in various places in the circuits of receiving and transmitting sets, either to vary the capacity in tuning or to store up the weak currents and discharge them in larger volumes across the telephone receivers. Fixed condensers are usually made of strips of tinfoil with insulators between them, the alternate strips of which are connected to the two sides of the circuit. Variable condensers usually consist of two series of aluminum plates, one fixed and one movable so that one series can be moved in or out of the other as the handle is turned. The air space between the plates serves as the insulator in this case. The telephone *receivers* used with radio receiving sets are wound with much finer wire than ordinary receivers and are much more efficient. They are usually in pairs, of watch case form and are connected with a headband so that the operator's hands are free. Loud speakers may be used with radio sets that will enable a roomful of people to hear the music, lectures, etc., sent out by broadcasting stations.

Transmission.—The equipment of a sending station comprises: a source of power, tuning devices similar to those in a receiving set for adjusting the wave length, a telephone transmitter or telegraph key, and an antenna consisting of a number of wires. The source of power used to produce the high frequency currents used in radio transmission may be the spark gap used in the older types of apparatus for telegraph only, a high frequency alternator of the Alexanderson type or in lower powered sets, a vacuum tube oscillator with amplifying tubes. A license is required for sending; none for receiving. Consult *Radio Simplified*, by Kendall and Koehler. (See also *Wireless.*)

Radioactivity (rā'di-ō-ak-tiv'i-ti), the property possessed by certain substances of projecting minute particles of matter into the surrounding space or of setting up vibrations of extremely short wave length in the ether. In 1896 Henri Becquerel, while examining the phosphorescence of a uranium salt, discovered that the latter produced darkening of a photographic plate in proximity to it even though the salt had not been previously exposed to sunlight. Shortly afterward Madame Curie, in collaboration with her husband, the late M. Pierre Curie, succeeded in separating from pitchblende, which is a uranium ore, the salt of an element possessing approximately two million times the radioactive power of uranium. To this element was given the name radium. In the same ore two other new radioactive elements were shortly afterward discovered, polonium and actinium. Thorium as well as uranium was also known to be radioactive, and in thorium bearing minerals there were found among others two radioactive elements which subsequently became of technical value, radiothorium and mesothorium.

Of the eighty or more elements known at the time of the discovery of radium only the two already mentioned, uraninm and thorium, were radioactive. By careful examination of the minerals containing these two elements, more than thirty radioactive elements, all related to one or the other of the former two, have been identified. As a result of the discovery of these new elements, many of the gaps formerly appearing in the periodic table (see *Chemistry*) between lead and uranium have been filled. Although between lead and uranium there are in all only nine places occurring in the periodic table, including those already occupied by bismuth, radium, and thorium, these thirty newly discovered substances possess such atomic weights as would necessitate them being inserted in the periodic table between the above mentioned elements. It was soon discovered that groups consisting of from two to six elements could be placed in some one of these nine columns of the periodic table. The elements constituting each group were identical in their chemical properties and therefore could not be isolated by chemical methods. Their atomic weights, however, differed. Such elements are said to be isotopic or are called isotopes.

Uranium and thorium, after projecting rays from their atoms, change into two other substances known respectively as uranium X1 and mesothorium 1. These latter elements in turn emit rays with the production of still other substances. By this process successively repeated uranium gives rise to some fourteen distinct elements, among the more important of which in the order of their formation are ionium (atomic weight 230) and radium (atomic weight 225). In a similar manner thorium is the parent substance of about a dozen derivatives.

In the above process three distinct types of rays can be distinguished; they are the alpha or positive rays, corresponding to the canal rays of an X-ray machine; the beta or negative rays, analogous to the rays originating at the cathode of the

same apparatus; and the gamma rays. All three classes of rays have certain radioactive properties in common; the power to penetrate matter, action upon photographic plates, the production of light when impinging upon fluorescent substances, and the ability to ionize gases, are possessed at least to some extent by all three types.

Alpha rays have weak penetrative power; they cannot pass through a piece of paper at a greater distance than three inches in the air. Likewise their action upon a photographic plate is slight, but their power to ionize gases is enormous. Alpha rays because of their positive charge are deviated from their course by a negative electric or magnetic charge. Their velocity upon expulsion from the parent substance is about one-tenth that of light, that is, about 18,600 miles per second. The alpha particle carries two positive charges which are the equivalent of four units of atomic weight. Thus, when the parent substance emits an alpha ray or particle, the resulting substance is moved two groups to the left in the periodic table and the atomic weight has diminished by four units. Furthermore the expulsion of an alpha particle reduces the valency (see *Chemistry*) of the element by two.

Beta rays have a greater penetrative power than alpha rays; they can pass through thin plates of metal. Of the three kinds of rays the beta type acts most powerfully upon a photographic plate. Their ionizing power is slight. Beta rays are negatively charged and are ordinarily called electrons. A substance, after it has thrown off a beta ray, moves one place to the right in the periodic table and increases its valency by one, but its atomic mass, unlike the effect produced by the loss of an alpha particle, does not change.

Gamma rays differ essentially from the two preceding types in the fact that they are true ether waves of the same character as light waves, but of much shorter wave length. They cannot be resolved into a spectrum by an ordinary diffraction grating, but when caused to impinge upon a crystal they will give a spectrum. In this manner the Braggs not only measured the wave length of gamma rays but also determined the arrangement of the atoms in the molecules of crystalline substances. Gamma rays have the greatest penetrative power; they can pass through very considerable thicknesses of such metals as lead. Their ionizing and actinic power is feeble.

Decomposition products are formed from uranium and thorium by the emission of one, two, or all three of the above types of rays. The intensity of the radiation is commonly measured by the ionizing effect of the rays upon the air surrounding an electroscope. By measuring the radiation in this manner it is possible to determine the period of average life of any radioactive substance. The average life of the substances in each of the series varies widely; uranium itself has an average life of eight billion years, and another decomposition product of the same series has the very transient life of one-millionth of a second. Radium, the sixth successive decomposition product of uranium, has an average life of 2240 years. Ionium, the immediate parent substance of radium, has a life of about 150,000 years, and the substance into which radium first decomposes lasts about 5½ days.

Radiolaria (-lâr'i-a), an order of Protozoa of the class Rhizopoda, characterized by possessing a central mass of sarcode inclosed in a porous, membranous, or chitinous capsule which is surrounded by a sarcode envelope. They often possess a siliceous or flinty test or siliceous spicules, and are provided with *pseudopodia*, or prolongations of their soft protoplasmic bodies, which stand out like radiating filaments, and occasionally run into one another. The Polycystina (q. v.) belong to the Radiolaria.

Radish.

Radiometer (rā-di-om'e-tėr), an instrument designed for measuring the mechanical effect of radiant energy. It consists of four crossed arms of very fine glass, supported in the center by a needle-point having at the extreme end thin disks of pith, blackened on one side. The instrument is placed in a glass vessel exhausted of air, and when exposed to rays of light or heat the wheel moves more or less rapidly in proportion to the strength or weakness of the rays.

Radio Telephone. See *Radio.*

Radish (rad'ish; *Raphănus satīvus;* natural order, Cruciferæ), a well-known cruciferous plant, unknown in a wild state, but cultivated for a number of centuries in Europe, and for many years in America. The tender leaves

are used as a salad in early spring, the green pods are used as a pickle, and the succulent roots are much esteemed.

Radium (rā'di-um), an elementary chemical substance discovered by Madame Curie, a Polish physicist, with the aid of her husband, in 1898. The property of radio-activity, that is, of the production of photographic effects by certain substances without the aid of light, discovered by Becquerel in uranium in 1896, led a number of physicists to experiments in this direction. In the hope of finding a substance in combination with uranium to which this property was due the Curies began a series of chemical reductions of pitch-blende, a mineral containing uranium, and found the radio-activity to increase as this substance was reduced, until finally a minute quantity of a constituent of pitch-blende was obtained which proved immensely more radio-active than uranium. This material was thought to be a new element. It was at first obtained only in combination with barium, but in 1910 Madame Curie succeeded in decomposing this compound and isolating radium, thus demonstrating its elementary character.

This remarkable element, originally obtained from the pitch-blende of Central Europe, is now found in the United States in greater quantity than elsewhere, being obtained from the mineral carnotite of Utah and Colorado. The ores of Paradise Valley, Colorado, are the richest radium producers in the world, but those of Green River Valley, Utah, are principally worked on account of cheaper transportation facilities.

This element has a high atomic weight (225 according to Curie, 257.8 according to Hertly), this being a characteristic of all known radio-active bodies. The study of radium proved it to be possessed of extraordinary powers previously unknown in any substance, and giving physicists new ideas as to the constitution of matter. Chief among these powers was that of emitting rays of three different kinds, which were thrown off at immense speed. One of these, which apparently consists of electrons (which see), is given off at a speed approaching that of light. A second, which appears to consist of helium, a substance heavier than hydrogen, is thrown off at a speed of 20,000 miles per second. The third kind is apparently a radiation, perhaps equivalent to the Roentgen ray. Another strange property of radium is its ability to maintain itself at a temperature a little higher than that of surrounding matter, a gramme of it giving out in an hour heat sufficient to raise 100 grammes of water 1° C. This heat production may be the result of energetic changes going on in the atom, and giving rise to its radiant action. In addition radium—with thorium and uranium—gives off emanations which have peculiar qualities. These are yielded in the form of gas, but can be solidified at low temperatures, and are then themselves temporarily radio-active. The radium emanation appears to change gradually into helium, and the apparent emission of helium as a ray would indicate that it is a product of atomic changes within the mass. The whole quantity f radium so far isolated is very minute, and the cost of operation keeps it at a very high price, yet it possesses powers of action on organic substance which may possibly prove of great medical value when fully understood. When heedlessly kept near the skin its rays produce severe burns, which are difficult to heal, and it is thought that it may prove useful in treating cancer and other external affections. Experiment, however, has not yet gone far enough to demonstrate its powers as a therapeutic agent.

Radix (rā'diks; L., a root), in mathematics, any number which is arbitrarily made the fundamental number or base of any system of numbers. Thus 10 is the radix of the decimal system of numeration; also in Briggs' or the common system of logarithms, the radix is 10; in Napier's it is 2.7182818284. See *Logarithms*.

Radnor (rad'nur), or RADNORSHIRE, an inland county in South Wales; area, 471 square miles. Pop. (1911) 22,589. The chief towns are Presteign, New Radnor and Knighton, all small places.

Radom (rā'dom), a town in Russian Poland, on the Radomka, capital of the government of the same name. It has manufactures of oil, vinegar, and leather. Pop. 28,749.—The government has an area of 4768 square miles; forms the most elevated portion of the Polish plain; is much wooded; agriculture and cattle-raising are the chief occupations of the inhabitants. The iron industry is important. Pop. 820,363.

Rae (rā), JOHN, an Arctic traveler born in the Orkneys, studied medicine at Edinburgh, became surgeon in the Hudson Bay Company's service in 1833, and made several exploring expeditions through the Northwest and to the Arctic coasts. He accompanied Sir John Richardson in his Franklin search (1848) in the Mackenzie and Copper-

mine region; conducted an expedition in 1850, and again in 1853-54, when his party discovered the first traces of Franklin's fate, for which he received the government grant of £10,000. He published *Expedition to the Shores of the Arctic Sea in 1846-47* (1850). Died in 1893.

Raeburn (rā'burn), Sir Henry, an eminent portrait-painter, born at Edinburgh in 1756. Bound apprentice to a goldsmith, he was no sooner free than he devoted himself to potrait painting, and with the view of improving in his art repaired to London, afterwards spending two years in Italy. Returning in 1787, he established himself in Edinburgh, and soon rose to the head of his profession in Scotland. His portraits are distinguished by grasp of character, breadth of treatment, and excellent color. He was knighted by George IV in 1822, and died the following year.

Raff (raf), Joachim, musical composer, born in Switzerland, of German parents, in 1822; died in 1882. He was encouraged by Mendelssohn and Liszt, and having gone in 1850 to live at Weimar, in order to be near Liszt, his opera, *König Alfred*, was first performed there at the Court Theater. His *Dame Kobold*, a comic opera, was produced in 1870, but his reputation rests chiefly on his symphonies (*Im Wald*, *Lenore*, etc.). He wrote also much chamber music of undoubted excellence. In 1877 he was appointed director of the Conservatoire at Frankfort, where he died. He was a sincere supporter of the Wagner school in music.

Raffael'lo. See *Raphael.*

Raffia. See *Raphia.*

Raffle (raf'l), a game of chance, in which several persons each deposit part of the value of a thing for the chance of gaining the whole of it.

Raffles (raf'felz), Sir Thomas Stamford, an English naturalist, born in 1781, died in 1826. He entered the East India Company's civil service, and in 1811, on the reduction of Java by the British, he was made lieutenant-governor of the island. In this post he continued till 1816, when he returned to England with an extensive collection of the productions, etc., of the Eastern Archipelago. The year following appeared his *History of Java*. Having been appointed to the lieutenant-governorship of Bencoolen, Sumatra, he went out in 1818 to fill this post; founded the settlement of Singapore, and returned to Europe in 1824.

Rafflesia (raf-lē'zi-a), a genus of parasitical plants, order Rafflesiaceæ, of which the chief species is *R. Arnoldi*. This gigantic flower, one of the marvels of the vegetable world, was discovered in the interior of Sumatra by Sir Thomas Raffles and Dr. Arnold. The whole plant seems to consist of little else beyond the flower and root. The perianth or flower forms a huge cup reaching a width of 3 feet or more; it weighs from 12 to 15 lbs., and some of its parts are ¾ inch in thickness. It is fleshy in character and appearance, remains expanded for a few days, and then begins to putrefy, having quite the smell of carrion, and thus attracting numerous insects.

Rafflesia Arnoldi.

Rafflesiaceæ (raf-lē-si-ā'se-ē), a natural order of parasitical plants or rhizogens, the species of which are found in the East Indies, Java, Sumata, etc., and in South America. The genus *Rafflesia* is the type. See *Rafflesia.*

Rafinesque (raf-in-esk'), Constantine Samuel, botanist, born in Galatz, Turkey, in 1784. He settled in the United States in 1815, and was made Professor of Botany in Transylvania University, Lexington, Ky., in 1818. Later, after lecturing in various places, he removed to Philadelphia. His publications include *Ancient History, or Annals of Kentucky*, *Medical Flora of the United States*, etc. He died Sept. 18, 1842.

Raft, a sort of float formed by a body of planks or pieces of timber fastened together side by side so as to be conveyed down rivers, across harbors, etc.; also any rough floating structure, such as those often formed in cases of shipwreck of barrels, planks, etc.

Rafters (raf'terz), are pieces of timber which, resting by pairs on the side walls of a building, meet in an

angle at the top, and form the main support of the roof.

Ragatz (rä'gatz), a town of Switzerland, canton of St. Gall, situated at the junction of the Tamina with the Rhine, 1700 feet above the sea, and connected by railway with Zürich and Coire. It is much resorted to both for its beautiful scenery and its mineral waters. Pipes are laid from Pfäffers, on the mountain side, by which the water is brought down from the hot springs there to a spacious bathing establishment without losing its high temperature. The permanent population is only about 2000, but there is a large number of visitors, for the accommodation of whom large hotels, restaurants, etc., have been provided. There is also a bathing establishment near the springs, erected in 1704. The temperature of the water is 97°-100°, and it is impregnated with carbonate of lime, magnesia, and salt. The village of Pfäffers lies 2 miles south of Ragatz at a height of 2696 feet.

Ragee (ra-gē'), RAGGEE, an Indian grain (*Eleusine coracāna*), very prolific, but probably the least nutritious of all grains. In the form of cake or porridge it is the staple food of the poorer classes in Mysore and on the Neilgherries.

Ragged Schools, institutions supported in Britain by voluntary contributions, which provide free education, and in many cases food, lodging, and clothing for destitute children, and so aid in preventing them from falling into vagrancy and crime. These schools differ from certified industrial schools in that the latter are for the reception of vagrant children and those guilty of slight offenses; but the two institutions are frequently combined. The idea of forming such schools was due to a Portsmouth cobbler, John Pounds, who about 1819 began to take in the ragged children of the district in which he lived and teach them while he was at work. The name of Dr. Guthrie, of Edinburgh, is prominent among those who developed this scheme of rescue.

Raghuvansa (ra-gö-vän'så), the title of one of the most celebrated Sanskrit poems. Its subject is the legendary history of the solar kings, or kings descended from the sun.

Raglan (rag'lan), FITZROY JAMES HENRY SOMERSET, LORD, born in 1788, youngest son of Henry, fifth duke of Beaufort, entered the army in 1804; was attached in 1807 to the Hon. Sir Arthur Paget's embassy to Turkey; and the same year served on Sir Arthur Wellesley's staff in the expedition to Copenhagen. He acted as military secretary to Wellesley during the Peninsular war, in which he greatly distinguished himself at the capture of Badajoz. At Waterloo he lost his right arm. From 1816 to 1819 he acted as secretary to the embassy at Paris; and from 1819 to 1852 as military secretary to the Duke of Wellington. In 1852 he was made master-general of the ordnance, and was elevated to the House of Peers as Baron Raglan. On the breaking out of the Crimean war he received the appointment of commander of the forces, and displayed much personal bravery as well as an amiable and conciliatory temper; but he had no great fitness for the position in which he was placed, and the repulse of the allies in their attack on the Redan, allied with other causes, aggravated the mild form of cholera from which he was suffering, and he expired June 28, 1855.

Ragozin (rag'o-zin), ZENAIDE ALEXEIEVNA, a Russian authoress, who became a citizen of the United States in 1874. She wrote *Siegfried, the Hero of the Netherlands; Beowulf, the Hero of the Anglo-Saxons,* and several works for the *Stories of the Nations* series.

Ragman Roll, the name of the collection of those instruments by which the nobility and gentry of Scotland were constrained to subscribe allegiance to Edward I of England in 1296, and which were more particularly recorded in four large rolls of parchment, consisting of thirty-five pieces sewed together, kept in the Tower of London.

Ragnarök (rag'na-rêk), in Scandinavian mythology, literally twilight of the gods, or doom of the gods, the day of doom when the present world will be annihilated to be reconstructed on an imperishable basis.

Ragout (ra-gö'; French, ragoût,) meat or fish stewed with vegetables, and highly seasoned to excite a jaded appetite.

Rags, though valueless for most purposes, are yet of great importance in the arts, particularly in papermaking. (See *Paper.*) Besides the rags collected in the United States, the article is imported in large quantities from various foreign countries. Woolen rags, not being available for paper, are much used for manure; but those of a loose texture, and not too much worn, are unraveled by means of machinery, and mixed up with good wool, to form what is known as *shoddy,* with which cheap woolen goods are made; while the refuse

is pulverized and dyed various colors, to form the flock used by paper-stainers for their flock-papers.

Ragstone (rag′stōn), a stone of the siliceous kind, so-named from its rough fracture. It effervesces with acids, and gives fire with steel. It is used for a whetstone without oil or water for sharpening coarse cutting tools. It is abundant in parts of England, as Kent and Newcastle. The term is also applied to certain limestones which contain many fragments of shells resembling rags.

Ragusa (rä-gö′zä), a seaport of Dalmatia, situated on a peninsula in the Adriatic, is surrounded by old walls flanked with towers, and has several forts. The streets rise terracewise, and none of the edifices are remarkable. The trade is now insignificant compared with former times. Ragusa is supposed to have been founded by Greeks in B. C. 589. Falling successively under the dominion of the Romans and the Greek emperors, it finally asserted its independence, but in 1806 was seized by Napoleon and in 1814 given to Austria. In 1919, following the defeat of Austria in the European war, it became part of the Serb-Croat-Slovene State (Jugo-Slavia). Pop. 11,561.

Ragu′sa, a town of Sicily, 29 miles W. S. W. of Syracuse, on the right bank of the river of its name, divided into Upper and Lower Ragusa. It has considerable manufactures of silk stuffs, and a trade in corn, wine, oil, etc. Pop. (1911) 39,850.

Ragwort (rag′wurt), RAGWEED, the popular name of various species of composite plants of the genus *Senecio*, found in Europe, so-called from the ragged appearance of the leaves. The common ragwort (*S. Jacobæa*) is a perennial with golden yellow flowers, growing by the side of roads and in pastures. It is a coarse weed, refused or disliked by horses, oxen, and sheep, but eaten by hogs and goats.

Rahway (rȧ′wā), a city of Union Co., New Jersey, on the Rahway River, 19 miles S. W. of New York. It has extensive manufactures of printing presses, woolen goods, cereals, cotton waste, automobiles, barrels, lacquer ware, chemicals, etc. Pop. (1920) 11,042.

Raiatea (rī-ä-tā′ä), one of the Society Islands in southeastern Polynesia; area, 75 sq. miles; pop. 1400, who have been converted to Christianity by English missionaries, and are governed by their own chiefs.

Rai Bareli (rī ba-rā′lē), a town of Oudh, India, administrative headquarters of district of the same name, on the banks of the Sai, 48 miles S.E. of Lucknow. There is a bridge over the Sai, several interesting ancient structures, and the usual government buildings. Pop. about 20,000.—The district forms the southernmost division of Oudh, has an area of 4881 square miles, and a population of about 3,000,000.

Raibolini (rī-bo-lē′nē), FRANCESCO DI MARCO DI GIACOMO, usually called FRANCESCO FRANCIA, a famous Italian painter, engraver, medallist, and goldsmith, was born at Bologna about the middle of the 15th century; died in 1533. He excelled particularly in *Madonnas*, and executed a number of admirable frescoes in the church of St. Cecilia at Bologna, but his most famous work is an altar-piece exhibiting the *Madonna, St. Sebastian*, etc., in the church of St. Giacomo Maggiore in the same city. Three works of his are in the British National Gallery. He was also celebrated as a portrait painter. Raibolini had a son, Giacomo, who studied under him, and acquired considerable celebrity.

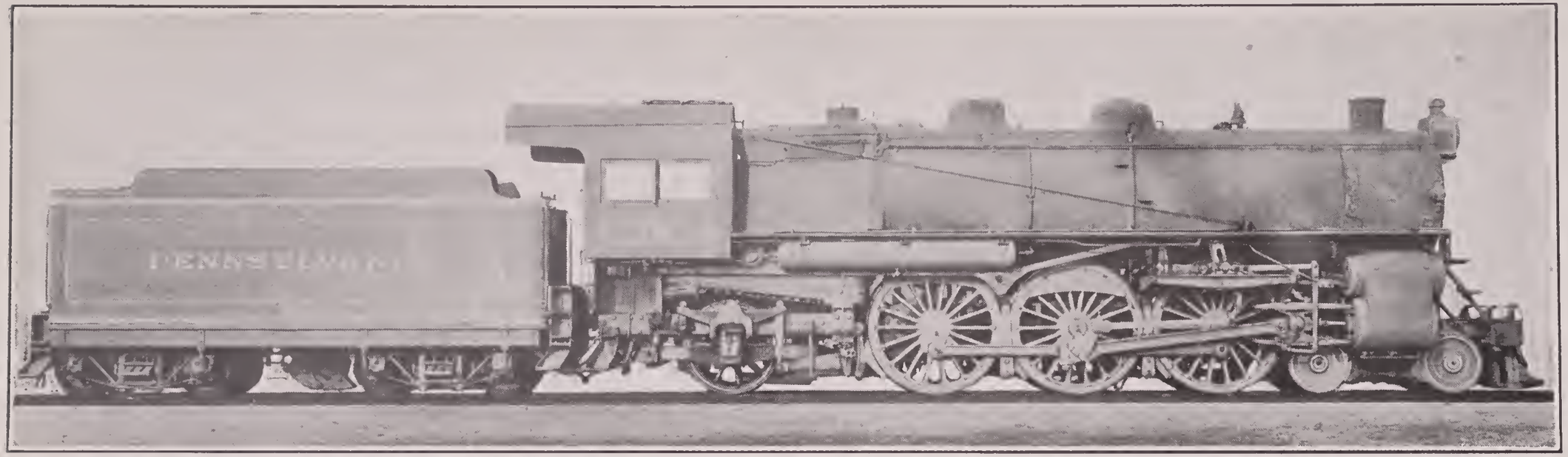
Ráigarh (rä-i-gar′), a native state of India, Central Provinces; area, 1486 square miles; pop. 128,943.

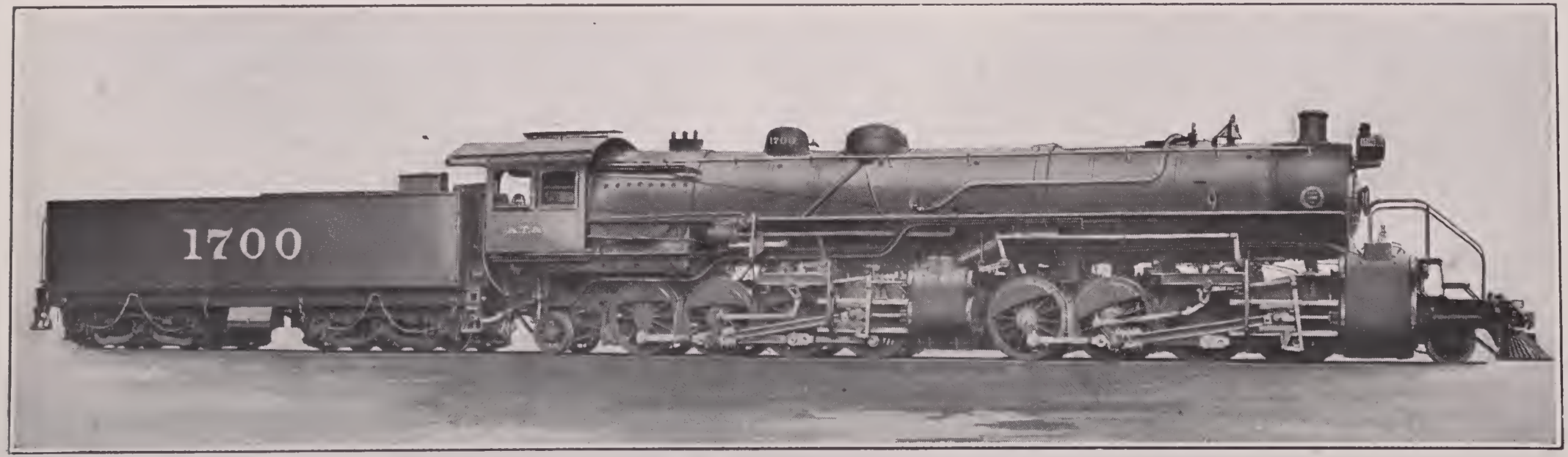
Raiidæ (rā′i-dē), the family of fishes to which the rays (skate, etc.) belong. See *Ray*.

Raikes (rāks), ROBERT, an English philanthropist, born at Gloucester in 1735; died in 1811. He was proprietor of the *Gloucester Journal*, and originated the system of Sunday-schools by gathering together a number of street children for secular and religious training.

Ráikot (rī-kōt′), a town of Hindustan, in the Punjab, surrounded by a wall and substantially built, formerly capital of a native state. Pop. 9219.

Rail (rāl), the common name of the Rallidæ, a family of grallatorial birds comprehending the rails proper (*Rallus*), the coots, water-hens, and crakes. They are characterized by possessing a long bill, which is more or less curved at the tip and compressed at the sides, by having the nostrils in a membranous groove, the wings of moderate length, the tail short, the legs and toes long and slender, the hind-toe placed on a level with the others. Most of the members of the family are aquatic or frequent marshes; but some, as the crakes, frequent dry situations. The principal species of the genus *Rallus* are the water rail of Europe (*R. aquaticus*), about 11 inches in length, of an olive-





Courtesy of the Pennsylvania Railroad and the Baldwin Locomotive Works.

MODERN LOCOMOTIVES

The upper view shows a passenger locomotive used on the fastest heavy express trains. It weighs 272,000 pounds, with tender 70 feet long, and has a draw-bar pull of 30,700 pounds. The lower view shows a Mallet Articulated Type freight locomotive, one of the largest ever built. It consists of two units, linked together to give flexibility to the wheel base. The locomotive is 108 feet 10 inches long, weighs 700,000 pounds, and has a draw-bar pull of 96,000 pounds. Oil is used for fuel.

brown color, marked with black above, and of a bluish-ash color beneath, with white transverse markings on the belly, much esteemed for the table; the Virginian rail of America (*R. virginianus*), somewhat smaller than the water rail of Europe, but a favorite game bird; and the great-breasted rail or fresh-water marsh-hen (*R. elegans*), about 20 inches long, which inhabits the marshes of the Southern States of America. The land rail, so-named, is the corn-crake (*Crex pratensis*). See *Corn-crake.*

Railroad, Railway (rāl'rōd, rāl'wā), a road made by placing on the ground, on a specially prepared track, continuous parallel lines of iron or steel rails, on which cars with flanged wheels are run with little friction and at consequent high velocities. These are usually called railroads in the United States and railways in other English-speaking countries, though the use of the word railway is growing in the former. The necessity for railways originated in the requirements of the coal traffic of Northumberlandshire, where the first of these, formed on the plan of making a distinct surface and track for the wheels, were constructed. In 1676, near Newcastle-on-Tyne, the coals were conveyed from the mines to the banks of the river, 'by laying rails of timber exactly straight and parallel; and bulky carts were made, with four rollers fitting those rails, whereby the carriage was made so easy that one horse would draw 4 or 5 chaldrons of coal.' Steam-power was first used on these tram-roads early in the nineteenth century, but the inauguration of the present great railway system of England dates from 1821, when an act was passed for the construction of the Stockton and Darlington Railway, which was opened in 1825. The Liverpool and Manchester line was opened in 1830 and other lines quickly followed until 1846, when upwards of 250 acts for the construction of railway lines were passed, the speculating mania culminating in a disastrous panic. The United States quickly followed Great Britain in railway construction. Indeed, it preceded England in steam transportation, as Oliver Evans, of Philadelphia, constructed a steam-dredging machine in 1804 which propelled itself on wheels a distance of 1½ miles through the streets. The use of steam engines on railroad tracks in the United States quickly followed their introduction in England, the first road for passenger traffic being the Baltimore and Ohio, built 1828–38, an American-built locomotive being used on it in 1830. From that time forward the railroad system was rapidly extended, until the United States reached and surpassed all other countries in this means of travel and freight carriage. There was no development of the railway system in France till about 1842, when several great lines were established; Belgium and the Netherlands followed, but Germany, Austria, and Russia were somewhat behind the Western European nations in their railway development. Within recent years the system has developed with remarkable rapidity and is being introduced with considerable activity in Africa and Asia, where an extensive railway construction is now under way.

The modern railway consists of one or more pairs of parallel lines of iron or steel bars, called *rails*, these bars joining each other endwise, and the parallel lines being several feet apart. The ends of the rails are held together by two strips of metal known as *fish-plates* which are bolted, one on either side, to the ends of the rails. The width between rails is called the *gauge*. What is known as the national or standard gauge used in the United States and the greater part of Europe, and formerly called the *narrow gauge*, measures 4 feet 8½ inches between the rails; the *broad gauge* (now going out of use) being 7 feet. It is believed to have originally represented the width suitable for the coal wagons of the north of England, and has been found on the whole very satisfactory. In Ireland the gauge is 5 feet 3 inches, in India 5 feet 6. Narrower gauges are used in certain special lines in all countries. A pair of parallel lines of rails constitutes a *single line* of railway, two pairs a *double line*, and so on. The rails are fastened by heavy spikes or bolts to wooden or iron (sometimes stone or concrete) supports called *sleepers* or *ties*, placed at frequent intervals and embedded in the material of the roadway. A railway, in general, approaches as nearly to a straight line between its two extremes as the nature of the country and the necessities of the intermediate traffic will permit. It is carried over valleys, either by *embankments* or *viaducts*, and through hills or elevated ground by deep trenches called *cuts*, or by tunnels. In favorable cases the surface line of the railway is so adjusted that the materials excavated from the cuttings will just serve to form the embankments. Should the excavated materials be in too small quantity to form the embankment, recourse is had to an excavation along the sides of the site of the latter to supply the deficiency. The line of rail-

way can seldom run for any distance on a level, and its various slopes are termed *gradients*, the arrangement of the rises and falls being termed the *grading* of the line. A more or less steep ascent is termed an *incline*. When the line is formed its surface is covered with broken stones or clean gravel called *ballasting*, and in this the sleepers for sustaining the rails are embedded. The wooden sleepers are laid across the roadway 2 or 3 feet apart from center to center, and to them the rails are spiked. When the railway track is thus completed the work is called the *permanent way*, and it furnishes the route over which railway cars of various kinds are drawn by a locomotive engine, a number of these vehicles forming a *train*.

In the railway of a single line of rail it is necessary to make provision for permitting meeting engines or cars to pass each other by means of *sidings*, which are short additional lines of rail laid at the side of the main line, and so connected with it at each extremity that a train can pass into the siding in place of proceeding along the main line. In double lines, in addition to sidings, which are in them also required at many places, it is necessary to provide for trains or cars crossing from one line of rails to another. This change in the direction of the carriage is effected by *switches*. *Switches* are short movable rails close to the main rails connected by rods to suitable handles, the extremities of these short rails being formed so as to guide the flanges of the wheels of a car from one line of rail to another. Switches are usually coupled or interlocked with the signals or signaling apparatus, so necessary for properly carrying on the traffic — coupled when they are moved simultaneously with the signals, interlocked when the necessary movement of the switches is completed before the signal is moved. Signaling is effected by means of semaphores in daylight and lights of three colors, white, green or blue, and red, at night. The telegraph is also used in regulating the traffic. (See *Block System.*) The various places along the line of railway, where trains stop for taking up or depositing freight or passengers are termed *stations* or *depôts*, with the prefix of *freight* or *passenger*, as they are allotted to the one or the other; the stations at the extremities of a railway are called *terminals*. In England coaches are called *carriages;* cars *trucks*, freight *goods*, baggage *luggage*.

The mode in which the locomotive acts in moving the trains of loaded cars is that by its weight and the friction of its wheels on the rails a tractive force is provided sufficient to enable it to move at a high rate of velocity, and to drag great loads after it. In some particular cases a fixed engine is employed to give motion to a rope by which the cars are drawn, the rope being either an endless rope stretched over pulleys, or one which winds and unwinds on a cylinder. Such engines are termed *stationary* engines, and are used chiefly on inclined planes, where the ascent is too steep for the locomotive engine. In some cases the cars are impelled by atmospheric pressure or by electricity. (See *Atmospheric Railway, Electric Railway.*) The locomotives, passenger cars, freight cars, etc., constitute the *rolling stock* of a railroad. In Britain the railway cars are usually from 20 to 30 feet in length, and are divided into compartments. There also, as in Europe generally, three classes of cars are used, to meet the varied demands of the traveling public. American cars are from 40 to 60 feet long with a center passage, the doors being at the ends — with the seats arranged transversely on each side. A platform at the end enables a person to go from end to end of the train. There is generally in the United States only one class of passengers, though on long journeys Pullman and other sleeping-cars are used at extra fares. (See *Pullman Car.*) Railways for the local service of large cities run usually on the street surface, but a system of overhead railways exists in some cities, as in New York, and subways or underground railways are rapidly extending, as in London, Paris, New York, Boston, Philadelphia, and Chicago.

Some of the tunnels, bridges, and viaducts constructed in connection with railways are among the engineering triumphs of the age. Of the former the most notable are the Mt. Cenis, St. Gothard, Arlberg, Simplon, and Loetschberg tunnels in the Alps; the Severn Tunnel in England, the Hoosac Tunnel in Massachusetts, the Pennsylvania Railroad Tunnel under New York City and the Trans-Andine Tunnel between Chile and Argentina. The greatest of the railway bridges are those over the Forth and the Tay in Scotland; the Britannia Tubular Bridge over the Menai Straits, in Wales; the Victoria Tubular Bridge, Montreal; the Eads bridge over the Mississippi at St. Louis, and the recent great cantilever bridge at Quebec. See *Forth Bridge, Tay Bridge*, also *Bridge*.

In Britain the railways are the property of joint-stock companies, who construct and work them under the powers

BIRD'S EYE VIEW, PENNSYLVANIA RAILROAD STATION

THE CONCOURSE, PENNSYLVANIA RAILROAD STATION

In the new Pennsylvania Railroad Station at Seventh Avenue and Thirty-second Street, New York City, the trains arrive and depart by a remarkable tunnel system extending under both rivers.

granted by act of parliament, and the same is the case in the United States, the railroads being owned by private companies, though to some extent controlled in their operation by Congress. In Europe generally the railways are owned and operated to a large extent by the government, this system existing everywhere except in the United States and Britain. Railways were at first local undertakings, but in the United States and Britain they have now come under the control of a few giant companies. Generally the American railways have hitherto been of a much less solid and substantial character than those of Britain, but this condition is rapidly being changed in the great trunk lines, some of which have been made of very substantial structure. The transcontinental lines of the United States include the Northern Pacific, from Lake Superior to the Pacific Coast; the Union Pacific, from San Francisco to the Eastern States; the Atchison, Topeka & Santa-Fe, the Southern Pacific, and the Great Northern, five systems in all, these ranging from 5000 to over 10,000 miles in length of track controlled. The only railway which competes with these great lines is the Trans-Siberian, of nearly 7000 miles' length of main line. In Canada the Canadian National Railways, with mileage of 22,757, comprising Canadian Northern system, Intercolonial, Transcontinental, Grand Trunk Pacific, and Grand Trunk, forms one of the largest government-controlled public utilities in the world. The Canadian Pacific has a mileage of 13,772 miles, and controls nearly 5000 additional on other systems.

In all countries the government exercises the right of granting or refusing permission to construct and operate railroads. Abuses of the United States management in America led to a movement in 1871 which secured laws adverse to the companies, limiting rates and prohibiting discrimination. This led in 1887 to the Interstate Commerce Act, passed to regulate rates, etc., and recently to an act prohibiting rebates in freight charges. Other legislation affecting railroad management has been passed by Congress, and the railroads are coming gradually under government control in the details of their operative methods. In 1910 Congress created a special court, called the Court of Commerce, having jurisdiction over railroad judicial cases, such as may be instituted by the Interstate Commerce Commission. The purpose of this court is to expedite the hearing of cases arising from railroad management.

Within recent years there has been great progress in railroad building, the construction of locomotives and cars, and the adoption of safety appliances in railroad operation. For an important instance of this see *Block System*. There has been great improvement in signaling, the telephone is beginning to supersede the telegraph in train handling, and station accommodation has greatly improved. Notable instances are the magnificent new Pennsylvania and Grand Central Stations in New York. The size and weight of locomotives have enormously increased over those of early days, some of the passenger locomotives weighing more than 200,000 pounds. The freight locomotives are still heavier, the Mallet compound weighing as high as 700,000 pounds. The same may be said of cars, both freight and passenger, which have increased greatly in weight and strength, steel sleeping cars now in use weighing over 150,000 pounds. In regard to speed the same may be said, the original 20 miles or less per hour having climbed up gradually until 60 miles per hour for considerable distances is not infrequent, while even greater speed has been attained. The fastest time on record for a distance of over 440 miles was made by the Lake Shore and Michigan Southern R. R. in 1905, running from Buffalo to Chicago, 525 miles, in 7 h. 50 m., an average of 69.69 miles per hour. For shorter runs speeds ranging from 70 to 84 miles per hour have been made, the greatest on record being a run of 5 miles in 2½ min., a rate of 120 miles per hour, on the Plant System. The railroad mileage in the United States has grown enormously, reaching in 1923 the great total of about 260,000 miles. British India has 37,000 miles; Germany, 34,000; Russia, 29,000; France, 27,000; Great Brittain (now consolidated into 4 systems), 24,000; Australia (government owned), 23,000; Brazil, 18,000. In January, 1918, the railroads of the United States were brought under government operation during the war. W. G. McAdoo (q. v.) was made director. They were returned to private ownership March, 1920. The U. S. Labor Board was established April 13, 1920, under the Transportation Act.

Railroad Rates. For years past the railroads of the United States have been accused of unjustly favoring large shippers in freight charges, and efforts to restrain them from this practice by legislation have been made. The giving of passes to favored persons has been restricted by law, and a bill was passed in 1910 by which the government was given control over the

railroad freight rates and all discriminations between shippers by the giving of rebates or in other ways strictly forbidden, under penalty of fine and imprisonment. The government was given the right to control and adjust rates, and prescribe just and reasonable rates, to investigate abuses, and in other ways to oversee and control railroad operations, and a court of commerce was instituted with the power of dealing with all charges of unjust dealing by 'common carriers.' As the matter now stands, the independent power of the railroads is greatly restricted, and, aside from direct ownership, they have been made in some degree government institutions.

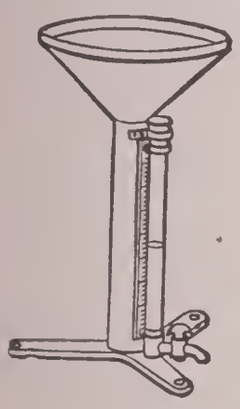
Raimondi (rī-mōn'dē), MARK ANTONIO, a famous Italian engraver; born in 1488, died in 1534. He was a friend of Raphael, who employed him to engrave some of his paintings, and was the first Italian engraver to attain great celebrity.

Rain (rān), the water that falls from the heavens. Rain depends upon the formation and dissolution of clouds. The invisible aqueous vapor suspended in the atmosphere, which forms clouds, and is deposited in rain, is derived from the evaporation of water, partly from land, but chiefly from the vast expanse of the ocean. At a given temperature the atmosphere is capable of containing no more than a certain quantity of aqueous vapor, and when this quantity is present the air is said to be saturated. Air may at any time be brought to a state of saturation by a reduction of its temperature, and if cooled below a certain point the whole of the vapor can no longer be held in suspension, but a part of it, condensed from the gaseous to the liquid state, will be deposited in dew or float about in the form of clouds. If the temperature continues to decrease, the vesicles of vapor composing the cloud will increase in number and begin to descend by their own weight. The largest of these falling fastest will unite with the smaller ones they encounter during their descent, and thus drops of rain will be formed of a size that depends on the thickness, density, and elevation of the cloud. The point to which the temperature of the air must be reduced in order to cause a portion of its vapor to form clouds or dew is called the dew-point. The use of the spectroscope has become to some extent a means of anticipating a fall of rain, since when light that has passed through aqueous vapor is decomposed by the spectroscope a dark band is seen (the *rain-band*), which is the more intense the greater the amount of vapor present. The average rainfall in a year at any given place depends on a great variety of circumstances, as latitude, proximity to the sea, elevation of the region, configuration of the country and mountain ranges, exposure to the prevailing winds, etc. When the vapor-laden atmosphere is drifted towards mountain ranges it is forced upwards by the latter, and is consequently condensed, partly by coming into contact with the cold mountain tops, and partly by the consequent expansion of the air due to the greater elevation. The presence or absence of vegetation has also considerable influence on the rainfall of a district. Land devoid of vegetation has its soil intensely heated by the fierce rays of the sun, the air in contact with it also becomes heated, and is able to hold more and more moisture, so that the fall of rain is next to impossible. On the other hand, land covered with an abundant vegetation has its soil kept cool, and thus assists in condensation. Although more rain falls within the tropics in a year, yet the number of rainy days is less than in temperate climes. Thus in an average year there are 80 rainy days in the tropics, while in the temperate zones the number of days on which rain falls is about 160. At the equator the average yearly rainfall is estimated at 95 inches. At a few isolated stations the fall is often very great. At Cherrapungee, in the Khasia Hills of Assam, 615 inches fall in the year, and there are several places in India with a fall of from 190 to 280 inches. The rainfall at Paris is 22 in.; London 22.50.; New York, 43 in.; Washington, 41 in.; San Francisco, 22 in.; Sitka, Alaska, 90 in.; Honduras, 153 in.; Maranhão, 280 in.; Singapore. 97 in.; Canton. 78 in.; New South Wales, 46 in.; South Australia, 19 in.; Victoria, 30 in.; Tasmania, 20 in.; Cape Colony, 24 in. The greatest annual rainfall hitherto observed seems to be on the Khasia Hills.

Rainbow (rān'bō), a bow, or an arc of a circle, consisting of all the prismatic colors, formed by the refraction and reflection of rays of light from drops of rain or vapor, appearing in the part of the heavens opposite to the sun. When the sun is at the horizon the rainbow is a semicircle. When perfect the rainbow presents the appearance of two concentric arches; the inner being called the *primary*, and the outer the *secondary* rainbow. Each is formed of the colors of the solar spectrum, but the colors are arranged in the reversed order, the red forming the exterior ring of the primary bow, and the interior of the

secondary. The primary bow is formed by the sun's rays entering the upper part of the falling drops of rain, and undergoing two refractions and one reflection; and the secondary, by the sun's rays entering the under part of the drops, and undergoing two refractions and two reflections. Hence, the colors of the secondary bow are fainter than those of the primary.

Rain-gauge (rān-gāj), or PLUVIOMETER (plö-vi-om'e-tėr), an instrument used to measure the quantity of rain which falls at a given place. It is variously constructed. A convenient form consists of a cylindrical tube of copper, with a funnel at the top where the rain enters. Connected with the cylinder at the lower part is a glass tube with an attached scale. The water which enters the funnel stands at the same height in the cylinder and glass tube, and being visible in the latter the height is read immediately on the scale, and the cylinder and tube being constructed so that the sum of the areas of their sections is a given part, for instance a tenth of the area of the funnel at its orifice, each inch of water in the tube is equivalent to the tenth of an inch of water entering the mouth of the funnel. A stop-cock is added for drawing off the water. A simpler form of gauge consists of a funnel having at the mouth a diameter of 4.697 inches, or an area of 17.33 square inches. Now as a fluid ounce contains 1.733 cubic inches, it follows that for every fluid ounce collected by this gauge the tenth of an inch of rain has fallen. Recently-constructed automatic gauges give a continuous record of rainfall, indicate the duration of each shower, the amount of rain that has fallen, and the rate at which it fell.



Rain-gauge.

Rainier (rā-nēr'), MOUNT, or MOUNT TACOMA, a mountain of the Cascade Range, in the southwestern part of the State of Washington, 40 miles from Tacoma. It is one of the highest peaks of the United States, being 14,363 feet above the level of the sea. Sulphurous fumes issue from its crater, but it is regarded as an extinct volcano. Well wooded below, there are 14 glaciers on the higher slopes.

Rainy Lake or RÉNÉ LAKE, a body of water forming part of the boundary between Minnesota and Canada. It is about 50 miles long, and of irregular breadth; receives the waters of numerous small lakes from the east and northeast, and empties itself by Rainy River, about 90 miles long, into the Lake of the Woods.

Raipur (rī-pör'), a town of India, headquarters of district of same name in the Chhattisgarh division, Central Provinces. It has an ancient fort, the usual government buildings, important schools, and does a large trade in grain, lac, cotton, etc. Numerous water-tanks are in the vicinity. Pop. 32,114.— The district includes within its limits four small feudatory states with a total area of 14,553 square miles.

Rais, or RETZ (rā or rās), GILLES DE LAVAL, SEIGNEUR DE, French marshal, born in 1396, died in 1440. He distinguished himself in the wars with the English, and acquired a disgraceful celebrity for outraging and murdering 140 or 160 children, and for other atrocities. He was hung and burnt for his crimes. See *Bluebeard.*

Raised Beaches. See *Beaches, Raised.*

Raisins (rāz'nz), the dried fruit of various species of vines, comparatively rich in sugar. They are dried by natural or artificial heat. The natural and best method of drying is by cutting the stalks bearing the finest grapes half through when ripe, and allowing them to shrink and dry on the vine by the heat of the sun. Another method consists of plucking the grapes from the stalks, drying them, and dipping them in a boiling lye of wood-ashes and quicklime, after which they are exposed to the sun upon hurdles of basket-work. Those dried by the first method are called raisins of the sun or sun-raisins, muscatels, or *blooms;* those by the second, *lexias.* The inferior sorts of grapes are dried in ovens. Raisins are produced in large quantities in the south of Europe, Egypt, Asia Minor, California, etc. Those known as Malagas, Alicantes, Valencias, and Denias are well-known Spanish qualities. A kind without seeds, from Turkey, are called *sultanas.* The Corinthian raisin, or currant, is obtained from a small variety of grape peculiar to the Greek islands. The uses of raisins as a dessert and culinary fruit, and in the manufacture of wine, are well known.

Rajah, or RÂJÂ (rä'jä), in India, originally a title which belonged to those princes of Hindu race who, either as independent rulers or as feudatories, governed a territory; subsequently, a title given by the native governments, and in later times by the British government, to Hindus of rank. It is now not unfrequently assumed by the

zemindars or landholders, the title *Mahârâjah* (great rajah) being in our days generally reserved to the more or less powerful native princes.

Rájápur' (rä'jä-pör), two towns in India: (1) In the Bombay Presidency, at the head of a creek 15 miles from the sea. Pop. 7448. (2) In the N. W. Provinces, on the Jumna. Pop. 7329.

Rájmahál (räj-mâ-hâl'), a town in Hindustan, province of Bengal, on the Ganges, 68 miles W. N. W. of Murshidabad, formerly an important place, now little more than a collection of mud-huts.

Rájmahendri (raj-mâ-hen'drē), a town in Hindustan, capital of the Godavari district, Madras Presidency, on the east bank of the Godavari, just above its subdivision into two arms, 40 miles from the sea. Pop. about 30,000.

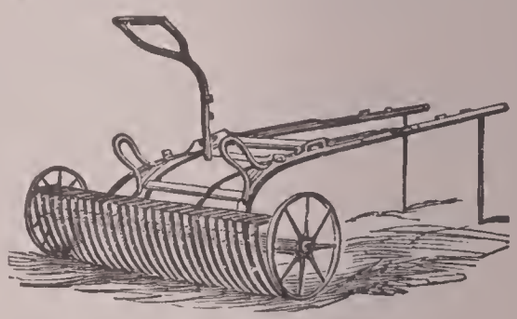
Rájpipla (räj-pē'plu), a native state of India, in Bombay Presidency, watered by the Nerbudda. Area, 1514 sq. miles; capital Nandod.

Rájputana (räj-pö-tä'nu), a large province of India, under the suzerainty of Britain since 1817, in the west part of Hindustan proper, extending from the Jumna and Chumbul Rivers west to Sind and Bhawalpur, and comprising the greater part of the Indian Desert. It includes the British district of Ajmere-Merwara and twenty autonomous states, each under a separate chief; has a total area of 127,540 square miles, and a pop. of 9,730,000. Rájputana is intersected by the Aravali Mountains, to the north of which the country is desert, and part of it wholly destitute of inhabitants, water, and vegetation. The soil is remarkably saline, containing many salt springs and salt lakes, and much of the well-water is brackish. To the south of the range the country is more fertile, being watered by the drainage of the Vindhya Mountains. The dominant race, though not the most numerous, is the Rájput, numbering about 700,000. They are the aristocracy of the country; and to a large extent they hold the land either as receivers of rent or as cultivators. They are essentially a military people, and many of their institutions bear a strong resemblance to the feudal customs which prevailed in Europe in the middle ages. They have likewise been celebrated for their chivalrous spirit, so unlike the effeminacy and duplicity of many of the oriental nations. The province, which is traversed by two railway lines, is administered by a governor-general's agent.

Rájputs (räj'pötz). See *Rájputana.*

Rájsháhi (räj-shä'hē), a division or commissionership of Bengal, extending from the Ganges to Sikkim and Bhutan. Area, 17,428 square miles; pop. 9,130,072.— Capital, Rámpur Beauleah.

Rake (rāk), an implement which in its simplest form consists merely of a wooden or iron bar furnished with wooden or iron teeth, and firmly fixed at right angles to a long handle. In



Horse-rake.

farming it is used for collecting hay, straw, or the like, after mowing or reaping; and in gardening it is used for smoothing the soil, covering the seed, etc. Large rakes for farm work are adapted for being drawn by horses; and there are many modifications both of the hand-rake and the horse-rake.

Rakoczy (rä-kō'tsi), a famous princely family, now extinct in the male line, which for some time ruled the principality of Siebenbürgen or Transylvania, and by maintaining the civil and religious rights of the inhabitants made itself equally serviceable to them and formidable to the house of Austria. The first prince of the name was SIGISMUND RAKOCZY, who obtained the government in 1606. The line ended with Prince FRANCIS LEOPOLD, born 1676. He led the Hungarian insurgents against Austria in 1703, and died in exile in 1735.

Rakoczy March, a simple yet stirring march by an unknown composer, and a very favorite one with the army of Francis Rakoczy (see above). It was adopted by the Magyars as their national march.

Rakshasas (räk'sha-haz), in Hindu mythology, a class of evil spirits or genii, cruel monsters, frequenting cemeteries, devouring human beings, and assuming any shape at pleasure. They are generally hideous, but some, especially the females, allure by their beauty.

Râle (räl), in pathology, a noise or crepitation caused by the air passing through mucus in the bronchiæ

tubes or lungs. There are various râles — the *crepitant*, the *gurgling*, the *sibilant*, the *sonorous*, etc. The râle or rattle which precedes death is caused by the air passing through the mucus, of which the lungs are unable to free themselves.

Raleigh (ral'i), a city of North Carolina, capital of the State and county seat of Wake Co. It is near the center of the State, 143 miles N. N. W. of Wilmington. Among the principal public buildings are the Capitol in Union Square, the State Museum, and the Olivia Raney Public Library. It is an important cotton and tobacco center, and has varied industries, including cotton, oil, and hosiery mills, fertilizer and carworks, etc. Raleigh was first settled in 1792. Pop. (1910) 19,218; (1920) 24,418.

Raleigh (ral'i), or RALEGH, SIR WALTER, navigator, warrior, statesman, and writer in the reigns of Elizabeth and James I, was the second son of a gentleman of ancient family in Devonshire, and was born in 1552. He studied at Oxford, and at the age of seventeen he joined a body of gentlemen volunteers raised to assist the French Protestants. Little is known of his adventures for some years, but in 1580–81

Sir Walter Raleigh.

he distinguished himself in the Irish rebellion, both by ability and severity. He now became a favorite at court, a result which has been traditionally attributed to an act of gallantry, namely, his throwing his embroidered cloak in a puddle in order that the queen might pass. In 1584 he obtained a charter of colonization and unsuccessfully attempted the settlement of Virginia in the following years, planting colonies on Roanoke Island, the colonists of which perished. In 1584, also, he obtained a large share of the forfeited Irish estates, and introduced there the cultivation of the potato. Through the queen's favor he obtained licenses to sell wine and to export woolens, was knighted and made lord-warden of the Stannaries or tin mines (1585), vice-admiral of Devon and Cornwall, and captain of the queen's guard (1587). In 1588 he rendered excellent service against the Spanish Armada, and subsequently vessels were fitted out by him to attack the Spaniards. In 1592 he incurred the queen's displeasure by an amour with one of her maids of honor, the daughter of Sir Nicholas Throckmorton. Although he made the best reparation in his power, by marrying that lady, he was imprisoned for some months, and banished the queen's presence. To discover the fabled El Dorado or region of gold he planned an expedition to Guiana, in which he embarked in 1595, and reached the Orinoco; but was obliged to return after having done little more than take a formal possession of the country in the name of Elizabeth. In 1596 he held a naval command against Spain under Lord Howard and the Earl of Essex, and assisted in the defeat of the Spanish fleet and the capture of Cadiz. Next year he captured Fayal in the Azores; in 1600 he became governor of Jersey. James I, on his accession in 1603, had his mind soon poisoned against Raleigh, whom he deprived of all his offices. Accused of complicity in Lord Cobham's treason in favor of Arabella Stuart, Raleigh was brought to trial at Winchester in November 1603, found guilty of treason, and sentenced to death. He was, however, reprieved and confined to the Tower. Here he remained for twelve years, devoting himself to scientific and literary work. In 1616 he obtained his release by bribing the favorite, Villiers, and by offering to open a mine of gold which he believed to exist near the Orinoco. The enterprise proved disastrous. Raleigh's force had attacked the Spaniards, and on his return James, to favor the Spanish court, with his usual meanness and pusillanimity determined to execute him on his former sentence. After a trial before a commission of the privy-council the doom of death was pronounced against him, and was carried into execution October 29, 1618. As a politician and public character Raleigh is doubtless open to much animadversion; but in extent of capacity and vigor of mind he had few equals, even in an age of great men His writings are on a

variety of topics, besides a few poetical pieces of great merit. His *History of the World* is one of the best specimens of the English of his day, having at once the style of the statesman and the scholar.

Rallentando (ral-en-tan'dō), also RITARDANDO, or LENTANDO (Italian), in music, indicates that the time of the passage over which it is written is to be gradually retarded.

Rallidæ (ral'i-dē), the rail family of birds. See *Rail.*

Ram, a steam iron-clad ship-of-war, armed at the prow below the water-line with a heavy iron or steel beak intended to destroy an enemy's ships by the force with which it is driven against them. The beak is an independent adjunct of the ship, so that, in the event of a serious collision, it may be either buried in the opposing vessel or carried away, leaving uninjured the vessel to which it is attached. By naval experts the ram is considered an important element in the solution of the problem of coast defense.

Ram, BATTERING. See *Battering-ram.*

Ram, HYDRAULIC. See *Hydraulic Ram.*

Rama (rä'ma), in Hindu mythology, the name common to a personage appearing as three incarnations of Vishnu, all of surpassing beauty.

Ramadan (rä'ma-dan), RHAMAZAN, or RAMADZAN, the ninth month in the Mohammedan year, during which it is said Mohammed received his first revelation. It is devoted to fasting and abstinence. From sunrise to sunset for the thirty days of its duration the Mohammedans partake of no kind of nourishment. After sunset necessary wants may be satisfied, and this permission is liberally taken advantage of. Believers are exempted in peculiar circumstances from observing the fast. As the Mohammedans reckon by lunar time, the month begins each year eleven days earlier than in the preceding year, so that in thirty-three years it occurs successively in all the seasons.

Râmâyana (rä-mä'ya-nä), the older of the two great Sanskrit epics (see *Mahâbhârata*) ascribed to the poet Valmiki, and dating probably from the 5th century B. C. The hero is Rama, an incarnation of Vishnu, as the son of the King of Oudh. It relates his marriage with Sita, their wanderings in the forests, the seizure of Sita by the giants of Ceylon, her recovery, and the restoration of Rama to the throne of his ancestors. It contains 24,000 verses, and is divided into seven books. See *Sanskrit Language and Literature.*

Rambootan (ram-bö'tan), the fruit of the tree *Nephelium lappaceum*, nat. order Sapindaceæ, much prized in the Malayan Archipelago. It is about the size of a pigeon's egg, and of a red color. It is said to be rich and of a pleasant acid.

Rambouillet (räṇ-bö-yā), a town of France, department of Seine-et-Oise, in a beautiful valley near the extensive forest of same name, 27 miles southwest of Paris. It is remarkable only for its château, long the residence of the kings of France, and a fine park, in which the first model farm in France was established. Pop (1906) 3965.

Rambouillet (räṇ-bö-yā), CATHERINE DE VIVONNE, MARQUISE DE, born at Rome in 1588, died in 1665. In 1600, when only twelve years old, she married Charles d'Angennes, son of the Marquis de Rambouillet, to whose title and estates she succeeded on the death of the latter in 1611. Her residence at Paris, the Hôtel Rambouillet, for more than fifty years formed the center of a circle which exercised great influence on French language, literature, and civilization. Her circle is said to have suggested Molière's comedy of the *Précieuses Ridicules*, but this play was not so much directed against it as against the numerous ridiculous coteries which sprang up in imitation.

Rameau (rä-mō), JEAN PHILIPPE, a French musical writer, born at Dijon in 1683, died at Paris in 1764. He was appointed organist in Clermont Cathedral, and in 1722 printed a treatise, entitled *Traité de l'Harmonie*, followed by *Nouvelle Système de Musique*, etc. His fame as a theorist chiefly depends on his *Demonstration of the Principles of Harmony*, published in 1750. This work procured him an invitation from the court to superintend the opera at Paris. He was also the author of several operas, and a great variety of ballets, concertos, gavottes, songs, etc. Louis XV acknowledged his merits by the grant of a patent of nobility and the order of St. Michael.

Ramee. See *Ramie.*

Ramée (ra-mē), LOUISE DE LA (OUIDA), an English novelist of French extraction, born at Bury St. Edmunds in 1840. She published her first novel, *Held in Bondage*, in 1863, and was subsequently a very prolific writer. Among her best works are *Strathmore, Chandos, Puck, Moths, Princess Napraxine, A House Party, Gilderoy,*

and particularly her great two-volume novel, *Under Two Flags*, of which both stage and film versions have been made. She died in Italy, Jan. 25, 1908.

Rameses (ram'e-sēz), or RAMSES (in Egyptian, 'the Child of the Sun'), the name given to a number of Egyptian kings.—RAMESES I was the first king of the nineteenth dynasty, but in no way notable.—RAMESES II, grandson of the preceding, was the third king of the nineteenth dynasty, and was born in the quarter of a century preceding the year 1400 B. C. He is identified by many with the Sesostris of Greek writers. (See *Sesostris*.) His first achievement was the reduction of Ethiopia to subjection. He defeated a confederation, among whom the Khita or Hittites were the chief, in a great battle near the Orontes in Syria, and in a subsequent stage of the war took Jerusalem and other places. He was a zealous builder and a patron of art and science. He is supposed to have been the king who oppressed the Hebrews, and the father of the king under whom the exodus took place.—RAMESES III, the Rhampsinitus of Herodotus, belonged to the twentieth dynasty, and was uniformly successful in war. He endeavored to surpass his ancestors in the magnificence of his buildings.

Rameses, one of the treasure cities of Egypt built by the Hebrews during the oppression, and probably named after Rameses II. It has been identified by Lepsius with Tell-el-Maskhûta on the Fresh-water Canal (about 12 miles west of the Suez Canal), and by Brugsch with Tanis, the modern San.

Rameswaram (rä-mes'wu-rum), a low sandy island in the Gulf of Manaar, between the mainland of India and Ceylon. It is about 11 miles long and 6 broad, and contains one of the most venerated Hindu temples in India, the resort of thousands of pilgrims. Pop. 17,854.

Rámgarh (räm-gur'), a town of India, in Jaipur state, Rajputana. Pop. 11,313.

Ramie, RAMEE (ra-mē'), a name applied to various fiber-plants of the nettle family or to the fiber yielded by them. The chief of these are *Boehmeria nivea*, or China grass (also called *Urtica nivea*) and *Boehmeria tenacissima* (or *U. tenacissima*), which some maintain to be the true ramie plant. (See *China Grass*.) A kind of ramie has also been prepared from a common European nettle (*Urtica dioica*), and from *Laportea canadensis*, a North American nettle, introduced into Germany as a fiber plant.

Ramillies (rä-mi-yē), a village of Belgium, province of Brabant, 13 miles north of Namur, and 28 southeast of Brussels. On May 23, 1706, the Duke of Marlborough gained here a great victory over the French under Marshal Villeroi.

Ramists (ram'istz), the followers or disciples of Peter Ramus. See *Ramus*.

Rammohun Roy (räm'ō-hun), an Indian rajah, founder of the Brahmo-Somaj (which see) sect of theists; born at Burdwan, Bengal, in 1776; died near Bristol in 1833. His parents were Brahmans of high rank. He acquired a mastery of Sanskrit, Persian, Arabic, English, Latin, Greek, and Hebrew. A careful study of the sacred writings of the Hindus had convinced him that the original Hindu religion was theistic, and he became anxious to reform the creed and practice of his countrymen in this direction. From the perusal of the New Testament he found the doctrines of Christ more in harmony with his own opinions than any others which had come to his knowledge, and in 1820 he accordingly published a work entitled the *Precepts of Jesus the Guide to Peace and Happiness*, consisting chiefly of a selection of moral precepts from the Evangelists. Rammohun Roy, in his doctrinal views, was a Unitarian, or Arian, holding, however, the pre-existence and superangelic dignity of Christ. In 1833 he visited England as ambassador from the King of Delhi, and while there was seized with a fever, which proved fatal.

Rámnád (räm-näd'), a town of India, presidency of Madras, near the Gulf of Manaar. It has a fort, a palace, a Protestant and two Roman Catholic churches. Pop. 14,000.

Rámnagar (räm-nug'ur), a town of India, Benares district, Northwestern Provinces, about 2 miles above Benares city. It is a considerable commercial center, and the residence of the Maharajah of Benares. Pop. about 10,000.

Rampant (ram'pant), in heraldry, standing upright upon its hind-legs (properly on one foot) as if

Rampant.

Rampant gardant.

attacking; said of a beast of prey, as the lion. It differs from *salient*, which means in the posture of springing forward. *Rampant gardant* is the same as *rampant*, but with the animal looking full-faced. *Rampant regardant* is when the animal in a rampant position looks behind.

Rampart (ram'pârt), an elevation or mound of earth around a place, capable of resisting cannon-shot, and on which the parapet is raised. The rampart is built of the earth taken out of the ditch, though the lower part of the outer slope is usually constructed of masonry. The term in general usage includes the parapet itself.

Ramphastos (ram-fas'tus), the generic name of the toucans.

Rampion (ram'pi-un), *Campanŭla Rapuncŭlus*, a plant of the nat. order Campanulaceæ, or bellworts, indigenous to various parts of Europe. Its root may be eaten in a raw state like radish, and is by some esteemed for its pleasant nutty flavor. Both leaves and root may also be cut into winter salads.

Rámpur (räm-pör'), capital of a native state of the same name, Northwestern Provinces of India, on the left bank of the Kosila River, 18 miles E. of Moradabad. It is the residence of the nawab, and has manufactures of pottery, damask, sword-blades, and jewelry. Pop. 78,758.— The state, which is under the political superintendence of the government of the Northwestern Provinces, has an area of 945 square miles and a pop. of 533,000.

Rámpur Beauleah (be-a'le-ä), a town of India, capital of Rájshâhi district, Bengal, on the N. bank of the Ganges. It has a large traffic by river with the railway station of Kushtia on the opposite bank. Pop. 21,589.

Ramree (rum-rē), or RAMRI ISLAND, in the Bay of Bengal, off the coast of Burmah, is 40 miles long and 15 in breadth. Produces rice, indigo, sugar, petroleum, etc.

Ramsay (ram'zē), ALLAN, a Scottish poet, born in 1686, at Leadhills, in Lanarkshire; died at Edinburgh in 1758. His father, who was superintendent of Lord Hopetoun's mines, died when Allan was yet an infant. He removed to Edinburgh in his fifteenth year and was apprenticed to a wig maker, an occupation which he followed till his thirtieth year. His poems, most of them printed as broadsides, soon made him widely known among all classes, and he now abandoned wig making, and commenced business as a bookseller. He was the first to start a circulating library in Scotland. In 1720 he published a collection of his poems in one volume quarto. In 1724 the first volume of *The Tea-Table Miscellany, a Collection of Songs*, appeared. The rapid sale of this compilation induced Ramsay to publish another, entitled *The Evergreen, being a Collection of Scots Poems wrote by the Ingenious before 1600*, which was equally successful. His next publication established his fame upon a sure and lasting basis. This was *The Gentle Shepherd* (1725) — the best pastoral perhaps in any language. In 1728 a second quarto volume of his poems appeared; and in 1730 his *Thirty Fables*, which concluded his public poetical labors. He did not give up his shop until within three years of his decease. He rendered great service to the vernacular literature by editing and imitating the old Scottish poetry, but his fame rests chiefly on the inimitable *Gentle Shepherd*.— His son ALLAN, born 1709, died 1784, became famous as a portrait painter in London. In 1767 he was appointed principal painter to George III.

Ramsay, SIR ANDREW CROMBIE, geologist, born in Glasgow in 1814. He joined the Geological Survey in 1841; was appointed to the chair of geology at University College, London, 1848; was lecturer at the School of Mines 1851; president of the Geological Society 1862; director-general of the Geological Survey and of the Museum of Practical Geology from 1872 to 1881. He was the author of *Physical Geology and Geography of Britain*, etc. He died in 1891.

Ramsay, ANDREW MICHAEL, known as the Chevalier Ramsay, was born in Ayr in 1686, died at St. Germain-en-Laye in 1743. After spending some time at the Universities of Edinburgh and St. Andrews he went to Leyden. In 1710 he repaired to Cambray, where he was converted to the Roman Catholic faith by Fénelon. He procured the preceptorship to the Duke of Château-Thierry and the Prince of Turenne, and was afterwards engaged to superintend the education of Prince Charles Edward Stuart and his brother Henry, afterwards Cardinal York. He acquired distinction by his writings, which are chiefly in French. The chief of these are a *Life of Viscount Turenne*, a *Life of Fénelon*, the *Travels of Cyrus*, a romance, and a large work on the *Principles of Natural and Revealed Religion*.

Ramsay, DAVID, an American patriot and historian, born in Penn-

sylvania in 1749; died at Charleston in 1815. He served as surgeon during the Revolutionary war, was a delegate to the Continental Congress in 1782–86, and president of the South Carolina Senate for seven years. He was shot by a lunatic. Chief works: *History of the Revolution in South Carolina*, *History of the American Revolution*, *History of the United States*, etc.

Ramsay, Edward Bannerman, son of Alexander Burnett, advocate, born at Aberdeen in 1793; died at Edinburgh in 1876. He adopted the name of his grand-uncle, Sir Alex. Ramsay, by whom he was educated. Educated at Cambridge he took holy orders, and came to Edinburgh in 1823 as a clergyman of the Scottish Episcopal Church, becoming dean of the diocese in 1846. He is best known by his *Reminiscences of Scottish Life and Character*, which had a great popularity.

Ramsay, Sir William, chemist, was born at Glasgow, Scotland, Oct. 2, 1852. He graduated at the Universities of Glasgow and Tübingen, and became Professor of Chemistry at University College, London. The new atmospheric element argon was discovered by him in association with Lord Rayleigh, and he added to this the elements neon, krypton, and zenon. He was knighted in 1902, and was considered one of the ablest chemists of the day. Died 1916.

Ramsden (ramz'den), Jesse, optician and philosophical instrument maker, born at Halifax, Yorkshire, in 1735; died at Brighton in 1800. He married a daughter of Dollond, the celebrated optician, and acquired a share of his father-in-law's patents. He gained great celebrity for his divided circles and transit instruments, and effected vast improvements in the construction of other instruments. He was chosen a fellow of the Royal Society in 1786, and of the Imperial Academy of St. Petersburg in 1794, and such was his reputation that he received orders for his instruments from every part of Europe.

Ramsey (ram'zi), a seaport on the northeast coast of the Isle of Man, 14 miles N. N. E. of Douglas. The attractive scenery, fine sands, promenade, and pier make it a favorite resort of tourists and pleasure-seekers. Pop. about 4729.

Ramsgate (ramz'gāt), a seaport and watering-place of England, county of Kent, in the Isle of Thanet, 67 miles east by south of London. The older parts occupy a natural hollow or valley in the chalk cliffs that line this part of the coast, while the newer portions occupy the higher ground on either side. It is a well-built town, possesses a fine stretch of sand and a promenade pier, and is much frequented by visitors. The harbor, which serves as a harbor of refuge for the Downs, is nearly circular, comprises an area of about 50 acres, and includes a dry dock and a patent slip for the repair of vessels. It is protected by two stone piers 3000 and 1500 feet long, with an entrance of 240 feet. Shipbuilding and rope-making are carried on; there is some trade in coal and timber, and a considerable fishery. Ramsgate was formerly a member of the Cinque Ports, and attached to Sandwich; it is now a separate municipal borough. Pop. (1911) 29,605.

Ramson (ram'sun), *Allium ursīnum*, a species of garlic found wild in many parts of Britain, and formerly cultivated in gardens.

Ramtek (räm'tek), a town of India, Nagpur district, Central Provinces, 24 miles N. of Nagpur city, celebrated as a holy place, and the resort of great numbers of pilgrims. Pop. 7814.

Ramtil Oil (ram'til), a bland oil similar to sesamum oil, expressed from the seeds of a composite annual herb, *Guizotia oleifera*, cultivated in Abyssinia and various parts of India.

Ramus (rā-mus), Peter, or Pierre de la Ramée, a French logician and classical scholar, born in Vermandois in 1515; killed in the massacre of St. Bartholomew in 1572. He went to Paris about 1523, and studied under great difficulties. He attacked Aristotle and the scholastics, and excited violent opposition. In 1551 he was appointed royal professor of rhetoric and philosophy at Paris. In 1561 he became a Protestant. He published a *Treatise on Logic* in 1543, which obtained great success, as did also his other works on grammar, mathematics, philosophy, theology, etc. His doctrines were widely diffused. France, England, and particularly Scotland were full of Ramists. His logic was introduced into the University of Glasgow by Andrew Melville, and made considerable progress in the German universities.

Rana. See *Frog*.

Rancé (rąṅ-sā). Armand Jean le Bouthillier de, the founder of the reformed order of La Trappe, born at Paris in 1626; died in 1700. He embraced the ecclesiastical profession, and held no fewer than six benefices. Residing at Paris, he gave himself up to a life of dissipation. In 1657, however, a marked change took place in his character. He demitted all his benefices ex-

cept the priory of Boulogne and the abbey of La Trappe. Retiring to the latter place in 1664, he began those reforms which have rendered his name famous. (See *La Trappe.*)

Ranch, a large farming area for the rearing of cattle and horses. The word is derived from the Spanish, rancho, meaning mess-room, but used in Mexico for a herdsman's hut and finally for a grazing farm. The business of ranching has long been pursued in the thinly-settled region of the United States from the Mississippi westward, especially in Texas and the great plains of the West. The advance of the farming population is narrowing the ranching country, and threatens eventually to bring the ranching business to an end, farm animals replacing those of the ranch.

Rand, THE, or WHITE WATERS RANGE, the name given the gold mining trail of the Transvaal region, extending 25 miles on each side of Johannesburg, South Africa. The yield of gold here has developed until now it surpasses any other mining region of the earth.

Randall (ran'dal), SAMUEL J., statesman, born in Philadelphia, Pennsylvania, in 1828. In 1862 he was elected to Congress, serving continuously until his death. He was speaker of the House from 1876 to 1881. As such he used his influence in guiding the House through the dangerous crisis produced by the uncertainty of the Presidential election of 1876. He died in 1890.

Randolph (ran'dolf), EDMUND JENNINGS, statesman, born at Williamsburg, Virginia, Aug. 10. 1753. He studied at William and Mary College and was admitted to the bar, becoming in 1775 the first Attorney General of Virginia. He helped to frame the constitution of Virginia, was its governor 1786–88, and in 1787 a member of the convention that framed the Constitution of the United States. He entered Washington's Cabinet as Attorney General in 1789, and become Secretary of State in 1794. He died Sept. 13, 1813.

Randolph, JOHN, statesman, 'of Roanoke,' born in Cawsons, Virginia, in 1773. As member of Congress he was preëminent for his poetic eloquence, his absolute honesty, and the scathing wit with which he exposed every corrupt scheme. He died in 1833.

Range (rānj), in gunnery, the horizontal distance to which a shot or other projectile is carried. When a cannon lies horizontally it is called the point-blank range; when the muzzle is elevated to 45 degrees it is called the utmost range. To this may be added the ricochet, the skipping or bounding shot, with the piece elevated from 3 to 6 degrees.

Ranger (rān'jer), a city of Eastland and Stephens counties, Texas, 95 miles w. of Fort Worth. It is in the center of one of the largest oil and gas producing areas in the country. It has four oil refineries and a number of casing-head gasoline plants; oil well supplies; rock crusher; lumber yards, tool shops, boiler works. Incorporated Feb. 7, 1919. Pop. 16,205.

Range Finder, an instrument for locating the position — direction and distance — of a moving object, as a hostile war-vessel. Large guns, with an effective range of several miles, are often placed behind an embankment, and the gunners need some means of determining quickly and accurately the position of a vessel or other object which is to be fired at. A system of triangulation is used, telescopes being placed on each side of the gun, the distance between them forming the base-line of the triangle and the angles found with it and the object yielding the length and direction of the other lines. Very accurate information is attainable by these instruments and by their aid the waste of projectiles is largely obviated.

Rangoon (rän-gön'), the capital of Lower Burmah, and the chief seaport of Burmah, is situated at the junction of the Pegu, Hlaing or Rangoon, and Pu-zun-doung rivers, about 21 miles from the sea. Since its occu-

pancy by the British in 1852 Rangoon has undergone such changes that it is practically a new town, and its population has increased fivefold. The principal streets are broad, and contain many large and not a few handsome buildings. There are the law-courts, post offices, Bank of Bengal, custom-house, Anglican and Roman Catholic churches, St. John's College, high-school, etc. A large and increasing commerce is carried on with British, Indian, and Chinese ports; and an extensive trade is conducted with inland towns as far as Mandalay. The chief exports are rice, timber, cotton, hides, gums and resins, mineral oil, ivory, precious stones; the imports being mainly manufactured goods. A number of rice-mills have been erected; there is a government, dockyard, and steam tram-cars have been introduced. Pop. 293,216.—The district of RANGOON produces rice, cotton, catechu, gambier, etc.; has an area of 4236 sq. miles, and pop. of 780,000.

Rangpur (rung-pör'), a district in the Rajshahi division of Bengal; area, 3486 sq. miles. This territory is flat and well-watered, the chief product being rice. RANGPUR, the capital, is situated on the Ghaghát river, 270 miles N. E. of Calcutta. Pop. about 15,000.

Raniganj (rä-nē-gunj'), a town of India, in Bardwán district of Bengal, on the north bank of the Dámodar river, 120 miles N. W. of Calcutta. It is notable chiefly for its bituminous coal, the seams of which are of great thickness. Pop. about 15,000.

Rank, a line of soldiers standing abreast or side by side: often used along with *file*, which is a line running from the front to the rear of a company, battalion, or regiment, the term *rank and file* thus comprising the whole body of the common soldiers.

Ranke (ràn'kė), LEOPOLD VON, a German historian, born in 1795. He studied at Halle and Berlin, became a teacher in the gymnasium of Frankfurt-on-the-Oder in 1818, and professor of history at the University of Berlin in 1825. His first published work (1824) was a *History of the Romance and Teutonic Nations from 1494 to 1535*. This was followed by other historical works, notably *History of England in the Seventeenth Century* (1859-68). He died May 23, 1886.

Rankin, JEANNETTE, the first woman member of Congress, was born at Missoula, Mont., in 1882; educated at the University of Montana, School of Philanthropy, New York, and the University of Washington at Seattle. In 1916 she was elected representative-at-large on the Republican ticket for Montana. She voted 'no' on the war resolution introduced in the House of Representatives in April, 1917, after being called three times. She prefaced her vote, in a voice choked with emotion, with the words: 'I want to stand by my country—but I cannot vote for war.' She defended labor and criticised the government for failing to prevent the lynching of Frank H. Little, an Industrial Workers of the World leader, in 1917.

Rankin, a borough of Allegheny Co., Pa., on Monongahela River, 8 miles E. of Pittsburgh. Has steel and wire works, etc. Pop. (1920) 7301.

Rankine (rank'in), WILLIAM JOHN MACQUORN, civil engineer, born at Edinburgh in 1820; died in 1872. He received his instruction in natural philosophy from Professor Forbes, his practical training as an engineer from Sir J. Macneill, and he became himself professor of engineering at Glasgow University in 1855. His numerous contributions to the technical journals have been reprinted (London, 1881), and he was the author of text-books on *Civil Engineering*, *The Steam Engine*, *Applied Mechanics*, *Shipbuilding*, etc. He was especially successful in investigating mathematically the principles of mechanical and civil engineering. He was also well known as a song writer.

Ransom (ran'sum), the money or price paid for the redemption of a prisoner, captive, or slave, or for goods captured by an enemy, and formerly a sum paid for prisoners of war.

Ranters (ran'terz), a name given by way of reproach to a denomination of Christians which sprang up in 1645. They called themselves *Seekers*, the members maintaining that they were seeking for the true church and its ordinances, and the Scriptures, which were lost. The name *Ranters* is also vulgarly applied to the Primitive Methodists, who formed themselves into a society in 1810, and who were in favor of street preaching, camp-meetings for religious purposes, as also of females being permitted to preach.

Ranunculaceæ (ra-nun-kū-lā'se-ē), a nat. order of exogenous polypetalous plants, in almost all cases herbaceous, inhabiting the colder parts of the world, and unknown in hot countries except at considerable elevations. They have radical or alternate leaves (opposite in Clematis), regular or irregular, often large and handsome flowers, and fruits consisting of one-seeded achenes or many-seeded follicles.

There are about 30 genera and 500 species. They have usually poisonous qualities, as evinced by aconite and hellebore in particular. Some of them are objects of beauty, as the larkspurs, ranunculus, anemone, and pæony. See next article.

Ranunculus (ra-nun'kū-lus), a genus of herbaceous plants, the type of the nat. order Ranunculaceæ. They have entire, lobed, or compound leaves, and usually panicled, white or yellow flowers. The species are numerous, and almost exclusively inhabit the northern hemisphere. Almost all the species are acrid and caustic, and poisonous when taken internally, and, when externally applied, will raise blisters. The various species found in the United States are known chiefly by the common names of crowfoot, buttercup, and spearwort. *R. flammŭla* and *sceleratus* produce a blister on the skin in about an hour and a half. Beggars use them for the purpose of forming artificial ulcers to excite the compassion of the public. *R. Ficaria* is the lesser celandine. *R. aquatilis* is the water crowfoot, a nutritive food for cattle.

Ranz-des-vaches (rąnz-dā-vâsh,) the name of certain simple melodies of the Swiss mountaineers, commonly played on a long trumpet called the *alpenhorn*. They consist of a few simple intervals, and have a beautiful effect in the echoes of the mountains.

Raoul Rochette. See *Rochette (Desiré Raoul)*.

Rapallo (rà-päl'lō), a town of Italy, province of Genoa, on a small bay 18 miles E. S. E. of Genoa. It is a winter residence for persons in delicate health. Pop. 5839.

Rape (rāp), the carnal knowledge of a woman forcibly and against her will. By the English law this crime is felony, and is punishable with penal servitude for life. In the United States the crime is treated as a felony, and the punishment is imprisonment for life or a term of years.

Rape, a division of the county of Sussex, an intermediate division between a hundred and a shire, and containing three or four hundreds. The like parts in other countries are called tithings, lathes, or wapentakes.

Rape (*Brassica Napus*), a plant of the cabbage family, cultivated in Europe and India for its seeds, from which oil is extracted by grinding and pressure. It is also cultivated in England for the succulent food which its thick and fleshy stem and leaves supply to sheep when other fodder is scarce. The oil obtained from the seed, which is much the same as colza oil, is used for various economical purposes, as for burning in lamps, for lubricating machinery, in medicine, etc. The oil-cake is used as food for sheep and cattle, and as a fertilizer. See next article.

Rape-cake, a hard cake formed of the residue of the seed and husks of rape after the oil has been expressed. This is used for feeding oxen and sheep, but it is inferior to linseed cake and some other kinds of oil-cakes; it is also used as a rich manure, and for this purpose it is imported into Britain in large quantities. See *Rape*.

Raphael (rā'fa-el, raf'a-el; or RAFFAELLO) SANZIO or SANTI, one of the greatest painters that ever lived, was born at Urbino, April 6, 1483. His father, Giovanni Sanzio, a painter of some merit, from whom young Raphael received his first instruction, died in 1494, and he was then intrusted to the care of an uncle. His studies, however, were not interrupted, and at the early age of twelve he was received into the studio of Perugino at Perugia as one of his pupils, and continued with that celebrated painter for six or eight years. The pupil was soon permitted to share in the

Raphael Sanzio.

master's work, and when he came to paint independently he was seen to have acquired Perugino's manner. About this time the painting of the library of the cathedral at Siena was intrusted to Pinturicchio, a fellow-pupil, and Raphael is said to have assisted in the work. In 1504 he visited his native town, and while there painted *Christ Praying on the Mount of Olives*, a *St. Michael*, and a *St. George*, the last two of which are

RAPHAEL'S SISTINE MADONNA

now in the Louvre. Towards the end of the same year he proceeded to Florence, attracted thither by the fame of its numerous artists, and in this center of the highest artistic life of the time he studied diligently over a period of four years, with short intervals of return to his native city. In Florence he rapidly gained a wider knowledge of his art, and soon began to forsake the manner which he had adopted from Perugino. The sources from which he sought and obtained the artistic knowledge which enabled him to develop his new style were various. From Michael Angelo he learned simplicity and strength of outline, from Leonardo da Vinci he acquired grace of expression and composition, while from Fra Bartolommeo he gained a subtler depth of coloring, and from Masaccio a broader treatment of drapery and dramatic effects. During the last two years of his stay in Florence he painted, in what is known as his Florentine manner, many of what are now considered his most important works. Of such may be mentioned the *Madonna del Gran Duca* (Florence); *Madonna del Giardino* (Vienna); *Holy Family* (Madrid); *Christ Bearing the Cross* (Madrid); *Marriage of Joseph and the Virgin* (Brera, Milan); the *Ansidei Madonna* (National Gallery); *Madonna* (belonging to Lord Cowper); *Tempi Madonna* (Munich); and the *Bridgewater Madonna* (Bridgewater House). About this time Pope Julius II had employed Bramante in rebuilding St. Peter's and in embellishing the Vatican, in which work Raphael was invited to assist. Here he executed the *Disputa*, or *Dispute of the Fathers of the Church*, on the wall of the second chamber, called the *stanza della Segnatura*, next to the great hall of Constantine. In this painting we recognize the transition to his third manner, which is still more clearly manifested in the *School of Athens*, the second painting in this chamber. Besides these he painted as Vatican frescoes (1508–11) the allegorical figures of *Theology*, *Philosophy*, *Justice*, and *Poetry*, in the corners of the ceiling; the *Fall of Adam*, *Astronomy*, *Apollo and Marsyas*, and *Solomon's Judgment*, all having reference to the four principal figures of the apartment; and, lastly, on the fourth wall, over the windows, *Prudence*, *Temperance*, and *Fortitude;* below them the *Emperor Justinian Delivering the Roman Law to Tribonian*, and *Gregory X Giving the Decretals to an Advocate*, and under them *Moses* and an armed allegorical figure. After the accession of the new pope, Leo X, Raphael painted, in the *stanza d'Eliodoro*, his *Leo the Great Stopping the Progress of Attila*, the *Deliverance of Peter from Prison*, and, on the ceiling, *Moses Viewing the Burning Bush*, the *Building of the Ark*, the *Sacrifice of Isaac*, and *Jacob's Dream*. With the *Conflagration of the Borgo Extinguished by the Prayers of Leo*, Raphael began the third *stanza* of the Vatican. It was followed by the *Coronation of Charlemagne*, *Leo III's Vindication of Himself before Charlemagne*, and the *Victory of Leo IV* over the Saracens at Ostia. During this time Raphael prepared designs for several palaces in Rome and other cities of Italy (notable among which were the series of designs in the Villa Farnesina to illustrate the story of *Cupid and Psyche*), finished the Madonna for the church of St. Sixtus in Piacenza (now in Dresden), and painted the portraits of *Beatrice of Ferrara*, of the *Fornarina*, of *Carondelet* (now in England), and of *Count Castiglione*. It was probably at a later period that Raphael prepared for Augustino Ghigi designs for the building and decoration of a chapel in Sta. Maria del Popolo and for Leo X the celebrated cartoons for the tapestry of one of the chambers of the Vatican. Seven of these cartoons are now in the South Kensington Museum. To this period also belong his easel-pieces of *John in the Desert* (of which there exist several copies); his *Madonna and Child*, on whom an angel is strewing flowers; a *St. Margaret* (Louvre); the *Madonna della Seggiola* (Florence), and *St. Cecilia* (Bologna). Raphael's last and unfinished painting — the *Transfiguration of Christ* — is in the Vatican. Attacked by a violent fever, which was increased by improper treatment, this great artist died at the age of thirty-seven years, and was buried with great pomp in the Pantheon. His tomb is indicated by his bust, executed by Naldini, and placed there by Carlo Maratti. His biography has been written by Vasari, Fuseli, Quatremère de Quincy, Passavant, Crowe and Cavalcaselle, and by many others. He died at Rome, April 6, 1520.

Raphania (ra-fā'ni-a), a disease attended with spasm of the joints, trembling, etc., not uncommon in Germany and Sweden, and said to arise from eating the seeds of *Raphănus Raphanistrum*, or field radish, which often get mixed up with corn.

Raphănus. See *Radish*.

Raphe (rā'fe), in botany, the vascular cord communicating between the nucleus of an ovule and the

placenta, when the base of the former is removed from the base of the ovulum.

Raphia (rā′fi-a), a genus of palms, rather low trees with immense leaves, inhabiting swampy coasts. They are found in W. Africa, Madagascar, Polynesia, Brazil, etc., and are used for a variety of purposes. See *Jupata Palm.*

Raphides (raf′i-dēz), a term applied to all crystalline formations occurring in plant cells. They consist of oxalate, carbonate, sulphate, or phosphate of lime.

Rapid City, county seat of Pennington Co., South Dakota, 150 miles w. of Pierre. The State School of Mines and an Indian school are here. It is in the Black Hills mining district with deposits of gold, tin, tungsten, mica, antimony and stone. Has flour and saw mills, machine shops, etc. Pop. 5777.

Rapid-Fire Gun, a cannon distinguished from a machine-gun by the fact that the former is loaded by hand, and may be fired by hand or machinery. Generally it is of larger caliber and has but one barrel, while the machine-gun may have more. The Hotchkiss varies in caliber from the 1-pounder 1.46 in., to the 100-pounder 6.10 in. The Driggs-Schroeder was invented in the United States and is very effective. The Nordenfeldt is another type. The Maxim is a semi-automatic gun, *i. e.*, after the first fire all the operations are performed by the gun itself, except the insertion of the cartridge by hand. Other notable types are the Armstrong, Canet, Gruson and Krupp. The caliber of rapid fire guns has been increased until the vessels of the United States navy are equipped with guns of this type of 4, 5, and 6 in. bore. See *Cannon, Machine-Gun,* etc.

Rapier (rā′pi-ėr), a light, highly-tempered, edgeless and finely-pointed weapon of the sword kind used for thrusting. It is about 3 feet in length, and was long a favorite weapon for duels. Its use now, however, is restricted to occasions of state ceremonial.

Rapp, GEORGE. See *Harmonists.*

Rapp (rap), JEAN, COUNT, a French general, was born at Colmar in 1772, and in 1788 entered the military service. On the breaking out of the war against Austria, in 1805, he accompanied Napoleon as aide-de-camp at the battle of Austerlitz. He died in 1821.

Rappahannock (rap-a-han′nok), a river of Virginia, which rises in the Blue Ridge, runs E. S. E. about 130 miles, and flows into Chesapeake Bay. It passes the towns of Falmouth, Fredericksburg, Port Royal, and Leeds, and is navigable to Fredericksburg, 110 miles.

Rappee (ra-pē′), a strong kind of snuff, of either a black or a brown color, made from the ranker and darker kind of tobacco leaves.

Rappoltsweiler (rap′olts-vī-lėr), a town of Germany, in Upper Alsace, at the foot of the Vosges Mountains. Pop. 6098.

Raptores (rap-tō′rēz), birds of prey, an order of birds, also called *Accipitres,* including those which live on other birds and animals, and are characterized by a strong, curved, sharp-

RAPTORES.
A. Foot of Peregrine Falcon. B. Head of Buzzard.

edged, and sharp-pointed beak, and robust short legs, with three toes before and one behind, armed with long, strong, and crooked talons. The eagles, vultures, falcons, and owls are examples.

Raratonga (rå-rå-ton′ga), or RAROTONGA, an island in the South Pacific Ocean, belonging to the group of the Hervey Islands. It is about 30 miles in circuit, and consisting of a mass of mountains, becomes visible at a great distance, and has a very romantic appearance. The inhabitants, about 4000, have been converted to Christianity.

Raritan (rar′i-tan), a river of New Jersey, formed by two branches which unitedly flow S. E., and fall into Raritan Bay near Perth Amboy. It is navigable as far as New Brunswick.

Ras, an Arabic word signifying 'head,' prefixed to the names of promontories or capes on the Arabian and African coasts.

Rasgrad (räz′grat), a town of Bulgaria, 34 miles southeast of Rustchuk. Pop. 13,871.

Rash, an eruption of red patches on the skin, diffused irregularly over the body. The eruption is usually accompanied with a general disorder of the constitution, and terminates in a few days.

Rashi (rash′i), properly RABBI SALOMON-BEN-ISAAK, a great Jewish rabbi, born at Troyes, France, in 1040;

died in 1105. His first instructor in Talmudic literature was his father, who was chief rabbi at Worms. To perfect his knowledge he made extensive journeys through Italy, Greece, Palestine, Egypt, Persia, and Germany, where he was particular in visiting the towns which possessed learned Jewish schools. His most famous work is a *Commentary on the Pentateuch;* he also wrote commentaries on the Prophets, the Talmud, and various treatises on miscellaneous subjects.

Rasht. See *Resht.*

Rask, RASMUS CHRISTIAN, a Danish philologist, born in 1787; died in 1832. After he had studied at the University of Copenhagen he journeyed through Sweden, Russia, and Iceland to increase his knowledge of northern languages, with the result that he published *An Introduction to the Knowledge of the Icelandic or Old Norse Tongue* (1811); an edition of Haldorsen's Icelandic Dictionary (1817); and an *Anglo-Saxon Grammar* (1817). In 1817-22 he made, at the expense of the government, a second journey to Russia, Persia, and India. He then returned to Copenhagen in 1822, was appointed professor of literary history and subsequently professor of oriental languages and librarian to the university. During this period he published a *Spanish Grammar*, a work on the Frisian language, and a treatise on the *Zendavesta*, in which he showed that the language was closely akin to Sanskrit.

Raskolniks (ras-kol'niks; Russian, *Raskolniki*, from *raskol*, schism), the collective name given to the adherents of the dissenting sects in Russia, which have originated by secession from the state church. The great majority of these sects date originally from the middle of the seventh century, when the liturgical books, etc., were revised under the patriarch Nikon. The Raskolniks clung fanatically to the old and corrupted texts, and regarding the czar and the patriarch as the representatives of Antichrist, called themselves *Staro-obryadtsy* (old ritualists) or *Starovertsy* (followers of the old faith). They have split up into a large number of sects, which may be grouped generally in two classes; those who have a priesthood, and those who have none. The tendency of the Raskolniks is communistic; and they have done much to spread Russian influence by advancing colonies on the outskirts of the empire. They have undergone much persecution at the hands of the government, but are now generally unmolested. They include about one-third of the merchant class, and nearly all the Cossacks, but none of the noble or cultivated class. Their numbers are variously estimated at from 3 to 11 millions; the last number is perhaps not far from the truth.

Rasores (r a - s ō′r ē z), gallinaceous birds or scratchers, an order of birds comprising the suborders Gallinacei, or fowls, turkeys, partridges, grouse, etc., and the Columbacei, or pigeons which are often made a distinct order. The common domestic fowl may be regarded as the type of the order. They are characterized by the toes terminating in strong claws, for scratching up seeds, etc., and by the upper mandible being vaulted, with the nostrils pierced in a membranous space at its base, and covered by a cartilaginous scale. The rasorial birds are, as a rule, polygamous in habits; the pigeons, however, present an exception to this rule, and their young are also produced featherless and helpless.

Rasp, a coarse species of file, but having, instead of chisel-cut teeth, its surface dotted with separate protruding teeth, formed by the indentations of a pointed punch.

Raspberry (raz'bèr-i), the fruit of the well-known shrubby plant *Rubus Idœus*, natural order Rosaceæ, and the plant itself, which is of the same genus as the bramble or blackberry, dewberry, and cloudberry. It is a native of Britain and most of Europe as well as Asia. Species are also found in America. Several varieties are cultivated, either red, flesh-colored, or yellow. Raspberries are much used in cookery and confectionery, and the juice, mixed with a certain portion of sugar and brandy, constitutes the liquor called *raspberry brandy. Raspberry vinegar*, a refreshing summer beverage and cooling drink for invalids, is composed of raspberry juice, vinegar, and sugar.

Rasputin, GREGORY, a Russian monk, born at Petrovsky, Siberia, about 1870. Although of peasant origin, he made his way into society circles in Petrograd, and even became intimate with Emperor Nicholas, over whom he was held to exercise mystic powers. He was believed to lead an immoral life, and was stabbed by a woman friend of a girl he had betrayed, but recovered by aid of the Emperor's physician. He was assassinated in 1916 by enemies who feared his influence over the Czar.

Rasse (ras; *Viverra Malaccensis*), a carnivorous quadruped, closely allied to the civet, spread over a great extent of Asia, including Java, various

parts of India, Singapore, Nepâl, and other localities. Its perfume, which is secreted in a double pouch like that of the civet, is much valued by the Javanese. For its sake the animal is often kept in captivity. It is savage and irritable, and when provoked can inflict a very severe bite.

Rastadt (rä'stat), or RASTATT, a town in the grand-duchy of Baden, on the river Murg, about 15 miles southwest from Carlsruhe. Its only notable building is the old castle of the Margraves of Baden, and it derives its chief modern importance from being a strong fortress commanding the Black Forest. Pop. (1905) 14,404.

Rat, one of the rodent mammalia, forming a typical example of the family Muridæ or mice. The best known species are the (so-called) Norway or brown rat (*Mus decumānus*), and the true English or black rat (*Mus rattus*). The brown rat grows to about 9 inches in length, has a shorter tail than the other, small ears, is of a brownish color above and white below, and is altogether a much larger and stronger animal. Supposed to have belonged originally to India and China, it became known in Europe only about the middle of the 18th century; but it is now found in almost every part of the habitable globe, and where it has found a footing the black rat has disappeared. It is a voracious omnivorous animal, swims readily in water, breeds four or five times in the year, each brood numbering about a dozen, and these again breed in about six months. The black rat is usually about 7 inches in length, has a sharper head than the other, larger ears, and a much longer tail. It is much less numerous than the brown rat and more timid. To this *Mus rattus* variety belongs the white rat, which is sometimes kept as a household pet. Various other animals are called rats. The rat is now believed to disseminate the germ of the bubonic plague, and great numbers have been killed in places where this disease has appeared. See *Kangaroo-rat*, *Mole-rat*, *Musk-rat*, and *Vole*.

Rata (ra'ta), a New Zealand tree. See *Metrosideros*.

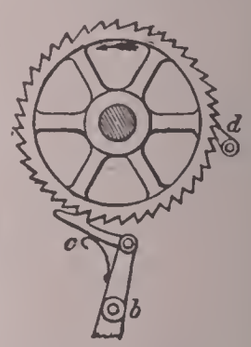
Ratafia (rat-a-fē'a), a fine spirituous liquor flavored with the kernels of several kinds of fruits, particularly of cherries, apricots, and peaches. *Ratafia*, in France, is the generic name of liquors compounded with alcohol, sugar, and the odoriferous and flavoring principles of plants.

Ratan'. See *Rattan Canes*.

Ratany (rat'a-ni; *Krameria triandra*), a shrubby plant found in Peru and Bolivia, having an excessively astringent root. It is sometimes used as an astringent medicine in passing bloody or mucous discharges, weakness of the digestive organs, and even in putrid fevers. It has silver-gray foliage and pretty red starlike flowers. Written also *Rhatany*.

Ratchet (rach'et), an arm or piece of mechanism one extremity of which abuts against the teeth of a ratchet-wheel; called also a *click*, *pawl*, or *detent*. If employed to move the wheel it is called a *pallet*. See next article.

Ratchet-wheel, a wheel with pointed and angular teeth, against which a ratchet abuts, used either for converting a reciprocating into a rotary motion on the shaft to which it is fixed, or for admitting of circular motion in one direction only, as in a winch, a capstan, etc. For both purposes an arrangement is employed similar to that shown in the figure, in which *a* is the ratchet-wheel, *b* a reciprocating lever, to the end of which is joined the small ratchet or pallet *c*. This ratchet, when the lever is moved in one direction, slides over the teeth, but in returning draws the wheel with it. The other ratchet *d* permits of the motion of the wheel in the direction of the arrow, but opposes its movement in the other direction.



Ratchet-wheel.

Ratel (rā'tel), or HONEY-BADGER, a carnivorous quadruped of the genus *Mellivŏra*, and of the badger family, found chiefly in South and East Africa, and in India. The Cape or South

Honey-ratel (*Mellivŏra ratel*).

African ratel (*M. ratel*) averages about 3 feet in length, including the tail, which measures 8 or 9 inches in length. The fur is thick and coarse, the color is black

on the under parts, on the muzzle, and limbs, while the tail, upper surface, sides, and neck are of grayish hue. It is celebrated for the destruction it makes among the nests of the wild bee, to the honey of which it is very partial.

Rathenow, or RATHENAU (rä'te-nou), a town of Prussia, province of Brandenburg, about 44 miles W. and by N. of Berlin, on the Havel. It has a church of the 14th and 16th centuries, and various manufactures, especially of optical instruments, wooden wares, machinery, etc. Pop. 23,095.

Rathkeale (rath-kēl'), a market town of Ireland, in the county of Limerick, on the Deel, about 19 miles southwest of Limerick. Pop. 2549.

Rathlin (rath'lin), or RACHLIN, an island of Ireland, belonging to the county of Antrim, 5 miles N. of Ballycastle. On it are the remains of a castle in which Robert Bruce took refuge when driven from Scotland in 1306. The island is about 6½ miles long by 1½ broad.

Ratibor (rä'tē-bōr), a town of Prussia, in the government and 40 miles S. S. E. of Oppeln, on the left bank of the Oder, about 10 miles from the Austrian frontier. It has a gymnasium and deaf and dumb institute, etc.; and manufactures of machinery and other iron goods, sugar, paper, glass, tobacco, etc. Pop (1905) 32,690.

Ratification (rat-i-fi-kā'shun), in law, the confirmation or approval given by a person arrived at majority to acts done by him during minority, and which has the effect of establishing the validity of the act which would otherwise have been voidable.

Ratio (rā'shi-ō), the numerical measure which one quantity bears to another of the same kind, expressed by the number found by dividing the one by the other. The ratio of one quantity to another is by some mathematicians regarded as the quotient obtained by dividing the second quantity by the first; by others, as the quotient obtained by dividing the first by the second; thus the ratio of 2 to 4 or a to b may be called either $\frac{2}{4}$ and $\frac{a}{b}$ or $\frac{4}{2}$ and $\frac{b}{a}$. Proportion, in the mathematical sense, has to do with the comparison of ratios, proportion being the equality or similarity of ratios. Ratio in the above sense is sometimes called *geometrical ratio*, in opposition to *arithmetical ratio*, or the difference between two quantities. Ratio is of various kinds: *Compound ratio.* When the one quantity is connected with two others in such a manner that if the first be increased or diminished the product of the other two is increased or diminished in the same proportion, then the first quantity is said to be in the *compound ratio* of the other two.— *Direct ratio.* When two quantities or magnitudes have a certain ratio to each other, and are at the same time subject to increase or diminution, if while one increases the other increases in the same ratio, or if while one diminishes the other diminishes in the same ratio, the proportions or comparisons of ratios remain unaltered, and those quantities or magnitudes are said to be in a *direct ratio* or proportion to each other.— *Inverse ratio.* When two quantities or magnitudes are such that when one increases the other necessarily diminishes, and vice versa when the one diminishes the other increases, the ratio or proportion is said to be *inverse.*

Ration (rā'shun), in the army and navy, the allowance of provisions given to each officer, non-commissioned officer, private, and sailor.

Rationalism (rash'un-al-izm), the doctrine which affirms the prerogative and right of reason to decide on all matters of faith and morals whatever so-called 'authority' may have to say on the matter. Rationalism has had perhaps its chief center and widest success in Germany; but its source may fitly be found in the English deism of the seventeenth and eighteenth centuries. The first step taken by the English deists was to attempt to eliminate from the doctrines of Christianity whatever is above the comprehension of human reason; their next step was to discard from Christianity whatever in the way of fact was such as could not be verified by any man's experience, and this led to an attempt to get rid of Christianity altogether. German rationalism was also influenced by the writings of Voltaire, the Encyclopedists, and the skeptical freedom of thought which obtained among the French *savants* at the court (1740-86) of Frederick the Great. It may be said to have begun with the translation into German of Tindal's *Christianity as old as the Creation* (1741), the application of a rationalistic method by Professor Wolff, of Halle University, to the philosophy of Leibnitz (1736-50), and the advent of Frederick the Great. The initial movements of rationalism were followed up by such scholars and theologians as Eberhard, Eichhorn, Paulus, Teller, and Steinbart. With the beginning of the nineteenth century, however, a new development occurred, when Schleiermacher

published in 1799 his *Discourses on Religion*. In his teaching he sought to establish a distinction between the dry rationalism of the understanding and the spiritual rationalism of what he called the religious consciousness. Instead of accepting the Old and New Testaments as the supreme standard of religious truth Schleiermacher recognized them as only the recorded consciousness of the early church; instead of finding in revelation a divine mode of conveying doctrine, he found it to be that illumination which the human mind receives from historical personages who have a genius for religion. In this form of reconstructive rationalism he was followed by De Wette, Fries and Jacobi, and this second period continued until 1835. In this year Strauss published his *Leben Jesu* ('Life of Jesus'), a work in which, from the Hegelian standpoint, and in a destructive spirit, he discusses the origin of the New Testament. The movement which this originated has taken a tendency which is chiefly associated with scientific materialism, agnosticism, etc., and rationalism as a distinctive phase of religious controversy may be said to have then ceased.

Ratisbon (rat'is-bon; German, *Regensburg*), a town of Bavaria, capital of the province of Oberpfalz or Upper Palatinate, stands on the right bank of the Danube, opposite the junction of the Regen, 65 miles N. N. E. of Munich and 53 miles S. E. of Nuremberg; 1010 feet above the sea. It is very irregularly built, and the streets are generally narrow and winding. The houses are more remarkable for their venerable appearance than for architectural merit, though some of them are imposing, having once been residences of the mediæval nobles, and having towers intended for defensive purposes. There are, however, several spacious and handsome streets and squares, and numerous fountains. The most remarkable public buildings are the cathedral, founded in 1275, restored in 1830-38, a noble example of German Gothic, with a lofty and imposing front, flanked by two towers with open-work spires, and having a richly-sculptured portal; the Rathhaus, where the German diet held its sittings from 1645 to 1806; the Romanesque church of St. Emmeran; the palace of the princes of Thurn and Taxis (formerly abbey of St. Emmeran); the ducal and episcopal palace, the royal villa, the mint, theater, synagogue, public library, antiquarian museum, picture-gallery, etc. The suburb Stadt am Hof, on the opposite bank of the Danube, is connected with Ratisbon by an old stone bridge. The manufactures embrace lead and colored pencils, porcelain and stoneware, hosiery, woolen cloth, leather, machinery, hardware, gloves, sugar, and tobacco. There are also breweries and other works. The river trade is important. About 6 miles to the east is the celebrated Walhalla (which see). Ratisbon existed under the Celtic name of *Radasbona* in pre-Roman times, and was a Roman frontier fortress under the name of *Castra Regina*. Subsequently it became the residence of the old dukes of Bavaria, rose to the rank of an imperial city, and continued long to be the chosen seat of the imperial diets. The sieges which it has stood number no less than seventeen. Pop. (1910) 52,624.

Ratitæ (ra-ti'te), Huxley's second division of the class of Aves or birds, the other two being the Saururæ and Carinatæ. See *Ornithology*.

Ratlines (rat'linz), small lines which traverse the shrouds of a ship horizontally, at regular distances of about 15 to 16 inches, from the deck upwards, forming a variety of ladders reaching to the mast-heads.

Ratnagiri (rut-nä'jē-re), a maritime district of India in the Konkan division of the Bombay Presidency. Area, 3922 sq. miles; pop. 1,203,638.—RATNAGIRI, the capital, on the Malabar coast, 170 miles S. of Bombay. Pop. 18,000.

Raton (ra-tōn'), a city, county seat of Colfax Co., New Mexico, near the Colorado border, in a stock-raising and farming section; there are also vast coal deposits in the vicinity. It is a division point of the Santa Fe Railroad. Pop. (1920) 5544.

Rat-snake, a snake destitute of poison fangs (*Coryphodon Blumenbachii*), domesticated in Ceylon on account of its usefulness in killing rats. It can easily be tamed.

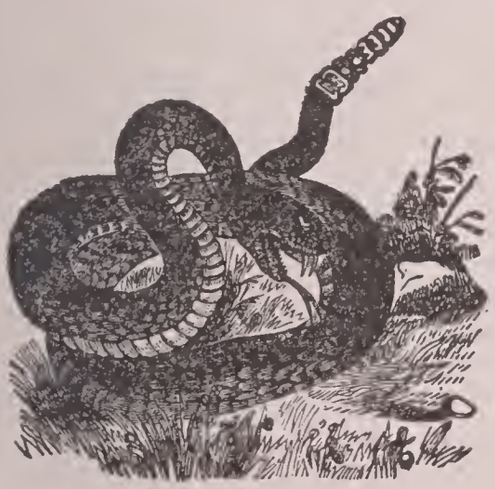
Rattan (ra-tan'), the commercial name for the long trailing stems of various species of palm of the genus *Calămus*, such as *C. Rotang*, *C. rudentum*, *C. verus*, etc., forming a considerable article of export from India and the Eastern Archipelago. They have all perennial, long, round, solid, jointed, unbranching stems, extremely tough and pliable. All the species are very useful, and are employed for wickerwork, seats of chairs, walking-sticks, thongs, ropes, cables, etc.

Rattany. See *Ratany*.

Rattazzi (rat-tat'sē), URBANO, an Italian statesman, born in

1808, died in 1873. He practiced as an advocate in his native Piedmont; in 1848 was returned as deputy to the Chamber at Turin; became leader of the democratic party, minister of the interior, and in 1849 practically head of the government. He became prominently unpopular in 1862 on account of his opposition to Garibaldi's advance on Rome.

Rattlesnake (rat'l-snāk), a name of various venomous American snakes of the genus *Crotălus*, family Crotalidæ, distinguished from the other members of the family by the tail terminating in a series of articulated horny pieces, which the animal vibrates in such a manner as to make a rattling sound. The function of the 'rattle' is dubious. The rattlesnake is one of the most deadly of poisonous serpents,



Rattlesnake (*Crotalus durissus*)

but hogs and peccaries kill and eat it, finding protection in the thickness of their hides and the depth of their layers of fat. The common northeastern rattlesnake (*C. horridus*) inhabits the wilder forested region; it attains a length of about 5 feet. In the northern middle section the forest rattlesnake (*C. durissus*) is smaller, but more common. In the southeast the diamond rattlesnake (*C. adamanteus*) becomes the largest serpent of the United States, reaching more than 8 feet in length and having a breadth of 12 inches. A similar, though somewhat smaller form (*C. atrox*), inhabits the southwest. The black rattlesnake (*C. confluentus*) and horned rattlesnake (*C. cerastes*) are typical western forms, being about the size of the first named. The prairie rattlesnake (*Sistrurus catenatus*), also called massasauga, is small, more active, and its bite is not considered dangerous.

Rattlesnake-root, a name for *Polygăla Senĕga*, an American plant supposed to cure the bite of the rattlesnake.

Rattlesnake-weed, the American plant *Eryngium virginicum*, used as a cure for the bite of the rattlesnake.

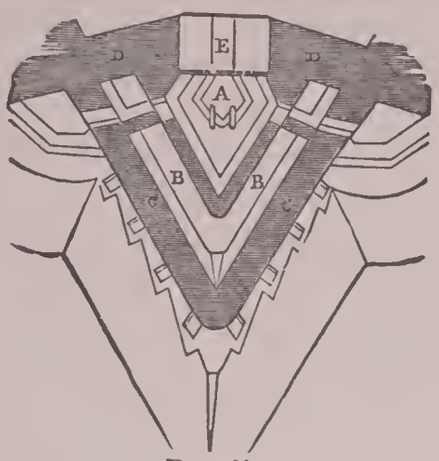
Rauch (rou*h*), Christian, one of the most distinguished of German sculptors, born at Arolsen in 1777; died in 1857. He received some instructions from the sculptor Ruhl, at Cassel, afterwards proceeded to Berlin to act as one of the royal lackeys, modeled a bust of the queen, and in 1804 went to Rome, where he made the acquaintance of Thorwaldsen and Canova, and obtained the patronage of Wilhelm von Humboldt. He received an invitation in 1811 from the king of Prussia to design a monument of Queen Louisa, and produced a noble work which established the fame of the artist. From this time onwards he was the sculptor of an immense number of works in all the branches of the statuary art. He was especially great in ideal figures and in portraiture. Among his *chefs d' œuvre* may be mentioned the monument of *King Frederick William III and Queen Louisa* in the Charlottenburg mausoleum, the colossal equestrian statue of *Frederick the Great* at Berlin, having the base surrounded by groups of his most distinguished contemporaries, and forming altogether one of the most notable monuments in Europe; the six colossal figures of *Victory* in the Walhalla, and a group representing *Moses with his hands supported by Aaron and Hur*.

Ravaillac (rå-vå-yåk), François, the murderer of Henry IV of France; born in 1578. He commenced life as valet to an attorney, and afterwards became attorney's clerk, and schoolmaster. He afterwards took service in the order of the Feuillants, but was expelled as a visionary. His various disappointments and his religious fanaticism led him to plan the assassination of Henry IV, which he successfully accomplished May 14, 1610. Upon this he was seized, horribly tortured, and put to death.

Ravelin (rav'lin), a detached triangular work in fortification, with two embankments which form a projecting angle. In the figure B B is the ravelin with A its redout, and C C its ditch, D D being the main ditch of the fortress, and E the passage giving access from the fortress to the ravelin.

Raven (rā'vn), a large bird of the crow family and genus *Corvus* (*C. corax*). Its plumage is entirely black; it is above 2 feet in length from the tip of the bill to the extremity of the tail, and about 52 inches from tip to tip

of the extended wings. It can be taught to imitate human speech, and in a domestic state is remarkable for its destructiveness, thievishness, and love of glittering things. It flies high, and scents carrion, which is its favorite food, at the distance of several miles; it feeds also on fruit, small animals, etc. It is found in every part of the globe.



Ravelin.

Ravenala (rav-e-na'la), a fine large palm-like tree of Madagascar, order Musaceæ (plantains), with leaves 6 to 8 feet long. It is called *travelers' tree*, because of the refreshing water found in the cup-like sheaths of the leaf-stalks. Its leaves are used for thatch and the leaf-stalks for partitions. The seeds are edible and the blue pulpy fiber surrounding them yields an essential oil.

Ravenna (rȧ-ven'nȧ), a town of Italy, capital of the province of the same name, on the Montone, about 4 miles west of the Adriatic, and 43 miles east by south of Bologna. It stands in a marshy district, has a circuit of about three miles, and its streets are in general regular and spacious. The principal edifices are the cathedral, founded in the fourth but rebuilt during the seventeenth century, consisting of nave and aisles with a dome, and adorned with some of Guido's finest paintings; the ancient baptistery, an octagonal structure; the church of San Vitale, an octagonal building with a large dome in the pure Byzantine style, one of the earliest of Christian churches, having been consecrated in 547; the Basilica of San Giovanni Evangelista, founded in 414, but much altered by restoration; the church of San Apollinare Nuovo (or San Martino), an excellent specimen of the ancient basilica; the mausoleum of the empress Galla Placidia, daughter of Theodosius the Great, dating from the fifth century; the palace of Theodoric, king of the Ostro-Goths; the tomb of Dante; the town-house, library, museum, etc. The manufactures are of little importance. Its harbor was in early times large enough to contain the fleets of Augustus, but it gradually silted up. It is now connected with the Adriatic by the Canale Naviglio at Porto-Corsini. Ravenna is an ancient place, and during the decline of Rome, A.D. 404, Honorius made it the seat of the Western Empire. In his reign and the regency of his sister Placidia it was adorned with many of its noblest edifices. Thereafter it fell into the hands of Odoacer, who in his turn was expelled by Theodoric, under whom it became the capital of the Goths. It was recaptured by Belisarius, who made the town and its territory an exarchate. This exarchate was terminated by Astolphus, king of the Lombards, who made Ravenna the metropolis of the Longobardic Kingdom in 752. Pepin and Charlemagne, having succeeded in expelling the Lombards, made a present of Ravenna and its exarchate to the pope, under whose control it remained till the year 1860. Pop. of commune, 71,580.

St. Apollinare ad Classem, Ravenna.

Ravenna, a city, county seat of Portage Co., Ohio, 38 miles S. E. of Cleveland. Here are the Cleveland Worsted Mills (1000 employees). Other industries include iron works, ambulance and hearse manufactures, rubber and rubber tire works, etc. Pop. (1920) 7219.

Ravensburg (rä'vens-börg), an old town of Würtemberg, in a valley on the Schussen, 22 miles E. N. E. of Constance. It is irregularly built, and has manufactures of paper, silk, flax, cotton, etc. Pop. 14,613.

Ravenscroft (rā'vens-kroft), Thomas, an English composer; born in 1592; died in 1640. He was trained in St. Paul's choir, and received the degree of bachelor of music

from Cambridge. In 1611 he published a collection of twenty-three part-songs, under the title of *Melismata;* in 1614 appeared another collection of part-songs, prefixed by an essay; and in 1621 he published his *Whole Book of Psalms*, containing a tune for each of the 150 psalms, harmonized in four parts by all the great musicians of the period.

Rawalpindi (rä'wäl-pin'dē), a town of British India, in the Punjab, capital of the district of its own name, situated in the doab formed by the Indus and the Jhilam. The barracks, capable of accommodating 2500 soldiers, are separated from the native town by the small river Leh. It has a good bazaar and a thriving transit trade between Hindustan and Afghanistan. Pop. 87,688.

Rawicz (rä'vich), or RAWITSCH, a town of Prussia, in the government and 55 miles south of Posen. It has manufactures of machinery, furniture, etc., and a trade in corn, cattle, and wool. Pop. (1905) 11,403.

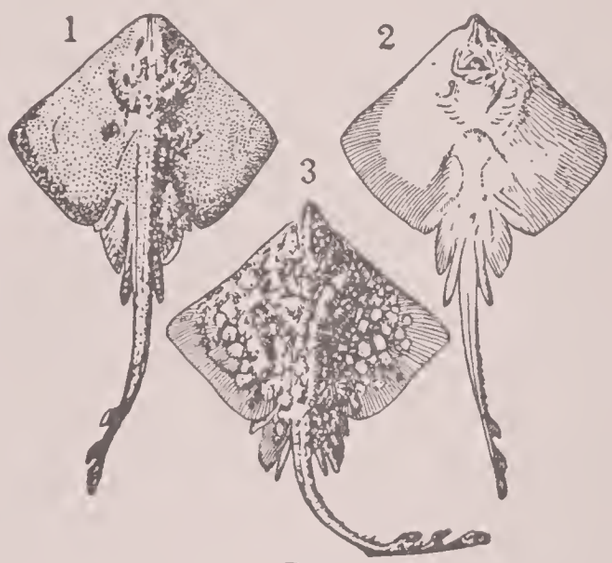
Rawlinson (rą'lin-sun), GEORGE, born in 1815, educated at Trinity College, Cambridge; took a first-class in classics; became public examiner in 1854; preached the Bampton Lectures in 1859; was elected Camden professor of ancient history in 1861, and made a canon of Canterbury in 1872. Besides various short works on antiquity he published a translation of *Herodotus* with a commentary (1858-60); *The Five Great Monarchies of the Ancient Eastern World* (4 vols. 1862-67), followed by the *Sixth* (1873) and the *Seventh Oriental Monarchy* (1876); *History of Ancient Egypt* (2 vols. 1881); *Egypt and Babylon* (1885); *Phœnicia* (1889), etc. He died Oct. 6, 1902.

Rawlinson, SIR HENRY CRESWICKE, brother of the above, born in 1810; educated at Ealing School; entered the Bombay army in 1827; went on a diplomatic mission to Persia in 1833; proceeded afterwards to Afghanistan as political agent; became consul at Bagdad in 1844; a member of the Indian Council in 1858; sat in the House of Commons in 1865-68; and was appointed president of the Royal Geographical Society 1871-76. He published *A Commentary on the Cuneiform Inscriptions of Babylon and Assyria* (1850); *Outline of the History of Assyria* (1852); *Notes on the Early History of Babylon* (1854); and the *Cuneiform Inscriptions of Western Asia*, edited in association with E. Norris and G. Smith (5 vols. 1861-70). He was made a baronet in 1891 and died March 5, 1895.

Rawmarsh (rą'märsh), a town of England in Yorkshire, in the south of the West Riding, 2 miles from Rotherham, with iron-works and collieries. Pop. (1911) 17,190.

Rawtenstall (rą'ten-stąl), a town of Lancashire, England, 8 miles north of Bury, with cotton and woolen manufactures and coal mines. Pop. (1911) 30,516.

Ray (rā), a family of elasmobranchiate fishes, including the skate and allied forms, recognized by the flattened body and by the extreme broad and fleshy pectoral fins, which seem to be mere continuations of the body. These fishes produce large eggs which are inclosed in cartilaginous capsules quadrilateral in form, with processes at the corners, and known familiarly as 'mermaids' purses,' etc. The most common members of this group are the thornback ray or skate (*Raia clavāta*), so named from the curved spines which arm the back and tail; and the common gray or blue skate (*R. batis*), which possesses an acutely pointed muzzle, the body being somewhat lozenge-shaped, and the color ashy-gray above. The starry ray (*R. radiāta*) is so-called from having a number of spines on its upper surface rising from rayed or starlike bases; it reaches a length of 30 inches. The sting ray (*Trygon pastināca*) occurs in the Mediterranean sea, and has the tail armed with a long spine.



RAYS
1, skate (top view); 2, same form below; 3, thorn-back

Ray, JOHN, an English naturalist, born in 1628; died in 1705. He was educated at Cambridge, where he became a fellow. He was elected a member of the Royal Society. His chief scientific works are: *Methodus Plantarum Nova*

(London, 1703, 8vo); *Historia Plantarum Generalis* (three vols. folio, 1686–1704); *Synopsis Methodica Animalium Quadrupedum et Serpentini Generis Vulgarium* (1693. 8vo); *Historia Insectorum* (1710, 4to); *Synopsis Methodica Avium et Piscium* (1713, 8vo); the *Ornithologia of Willughby*, arranged and translated (1676, three vols.); also an edition of his friend's *Historia Piscium* (1686, two vols. folio). Besides his numerous scientific writings, Ray published several works on divinity and other subjects, the best known of which are: *The Wisdom of God Manifested in the Works of the Creation*, a work which has run through many editions; *Collection of English Proverbs; Collection of Travels and Voyages*, etc. In 1844 a society named after Ray, the *Ray Society*, was formed in London for the promotion of natural history by the printing of original works, new editions, rare tracts, translations, etc., relating to botany and zoölogy, and which has issued a large number of valuable works.

Rayleigh (rā'li), John William Strutt, Lord, born Nov. 12, 1842, was educated at Trinity College, Cambridge, where he was senior wrangler and first Smith's prizeman in 1865. He was president of the British Association in 1884-85, was professor of experimental physics at Cambridge, and succeeded Professor Tyndall as professor of natural philosophy at the Royal Institution. With Prof. Ramsay he discovered a new gaseous element, argon, for which they received the $10,000 Hodgkins prize. They subsequently discovered the rare element krypton.

Raymond (rā'mond), Henry Jarvis, journalist, was born at Lima, New York, in 1820. He became managing editor of the *New York Tribune* in 1841, and founded the *New York Times* in 1851. Elected to the Assembly in 1849, he was made speaker, was subsequently elected lieutenant governor of New York, and in 1864 was elected to Congress. He died June 18, 1869.

Raynouard (rā-nö-är), François Juste Marie, a French poet and philologist, born at Brignoles, Provence, in 1761; died in 1836. He studied for the bar; was elected as a deputy to the Legislative Assembly; took part in the revolution and the affairs of the first empire; and became a member of the Corps Legislatif. He wrote several tragedies, such as *Scipion*, *Don Carlos*, *Charles I.* and *Les Templiers*, but he is chiefly remembered as a philologist who revived the study of Provençal by his *Choix des Poesies Originales des Troubadours* (1816–21, six vols. 8vo); *Lexique Roman, ou Dictionnaire de la Langue des Troubadours*, and a *Comparative Grammar of the Latins and Romancists.*

Razor (rā'zur), the well-known keen-edged steel instrument for shaving off the beard or hair. The edge and back of the blade are more or less curved, and the sides are slightly hollowed in grinding. It is usually made with a tang, which is fastened to the handle by a rivet. The handles are made of a great variety of materials. The great center of the razor manufacture has long been Sheffield, though great numbers of razors are now made in Germany and the United States. The savages of Polynesia still use two pieces of flint of the same size, or pieces of shells or shark's teeth ground to a fine edge. See *Safety Razor.*

Razor-back, one of the largest species of the whale tribe, the *Balænoptera* or *Rorquălus boreālis*, the great northern rorqual. See *Rorqual.*

Razor-bill, an aquatic bird, the *Alca torda* or common auk. See *Auk.*

Razor-fish, a species of fish with a compressed body, much prized for the table. It is the *Coryphæna novaeula.*

Razor-shell (*Solen*), a genus of lamellibranchiate mollusca, forming the type of the family Solenidæ. They are common on both sides of the Atlantic; the shells are subcylindrical in shape; the hinge-teeth number two on each valve; and the ligament for opening the shells is long and external in position. The mantle is open in front, to give exit to the powerful muscular 'foot,' used by these molluscs for burrowing swiftly into the sandy coasts which they inhabit. The familiar species are the *Solen siliqua*, *S. ensis*, *S vagīna*, *S. marginatus*, and *S. pellucidus.*

Razzi (rät'sē), Giovanni Antonio (Gianantonio), surnamed *Sodoma*, an Italian painter, born in 1479 at Vercelli in Piedmont; died in 1549 or 1554. At an early age he was brought to Siena, and as most of his life was spent there he is considered one of the painters of the Sienese school. He painted chiefly in fresco, and was employed by Julius II to decorate in the Vatican, but his best work is in the churches of Siena.

Ré, or Rhé (rā), Ile de, an island of France, in the Bay of Biscay, about 2 miles off the coast of department Charente-Inférieure, 6 miles west of Rochelle; greatest length, 18 miles; breadth, nearly 4 miles; area, 18,252 acres. The coasts on the south and west are lofty and pre-

cipitous, but there are several good harbors. Salt is produced from the salt marshes. Capital, Saint Martin de Ré. Pop. 15,600.

Rea (rā), SAMUEL, an American railway official, born at Hollidaysburg, Pennsylvania, September 21, 1855. He occupied various positions on the Pennsylvania and other railroads, and in January, 1913, became president of the Pennsylvania Railroad. Previously, as vice-president, he had charge of the construction of the New York tunnel extension and station, for the successful completion of which the University of Pennsylvania conferred upon him the honorary degree of doctor of science in 1910.

Reaction (rē-ak'shun), in physics, counteraction, the resistance made by a body to the action or impulse of another body, which endeavors to change its state, either of motion or rest. It is an axiom in mechanics that 'action and reaction are always equal and contrary,' or that the mutual actions of two bodies are always equal and exerted in opposite directions. In chemistry, the term is applied to the mutual or reciprocal action of chemical agents upon each other. In pathology, reaction is the action of an organ which reflects upon another the irritation previously transmitted to itself.

Read (rēd), THOMAS BUCHANAN, an American painter and poet (1822-72), born in Chester Co., Pa. His poems are marked by fervent patriotism and artistic power in the description of rural life. They embrace *The House by the Sea, The New Pastoral, Sylvia, or the Lost Shepherd, The Wagoner of the Alleghenies*, etc. Among his best pictures are *Longfellow's Children* and *Sheridan's Ride*, the latter illustrating his most famous poem.

Reade (rēd), CHARLES, novelist, was born in Oxfordshire in 1814; died in 1884. He was educated at Magdalen College, Oxford, and was called to the bar in 1843. He became first known by his novel of *Peg Woffington*, which he afterwards dramatized, in conjunction with Tom Taylor, under the title of *Masks and Faces*. This was followed by *Christie Johnstone*, and *Never Too Late to Mend*, in which he attacked the English prison system. The most artistic of his writings, *The Cloister and the Hearth*, dealing with the lives of the parents of Erasmus, appeared in 1861.

Reader (rē'der), specifically, one whose office it is to read prayers, lessons and the like at religious services. In the Roman Catholic Church a reader is the second among the four inferior orders. In the Christian Science Church those who conduct the services, reading from the Bible and the Christian Science Text Book are styled readers. Also one who corrects proofs. See *Printing*.

Reading (red'ing), RUFUS DANIEL ISAACS, first earl (1860-), an English jurist of Jewish descent, born in London and educated at University College School and in Brussels and Hanover. From 1904 to 1913 he was member of Parliament for Reading. He became lord chief justice of England in 1913 and in 1918 was appointed High Commissioner and Special Ambassador to the United States. He was knighted in 1910, created baron in 1914 and earl in 1917. He was appointed Viceroy of India in 1921.

Reading, a parliamentary and municipal borough of England, capital of Berkshire, on the Kennet, near its junction with the Thames, 36 miles W. of London. It has biscuit factories, iron foundries, etc. Pop. 75,214.

Reading, a town of Middlesex Co., Mass., 12 miles N. of Boston. Its manufactures include organ pipes, rubber goods, wire brushes, boots and shoes, etc. Pop. (1920) 7439.

Reading, a city, county seat of Berks Co., Pennsylvania, picturesquely situated on the Schuylkill River, with Mount Penn to the east and Neversink Mountain to the west, 58 miles N. of Philadelphia, 126 miles W. of New York, on the Pennsylvania and Philadelphia & Reading railroads. It is a great industrial center, with more than 750 manufacturing plants; value of products $200,000,000 annually. Of these, one-half consists of iron and steel (metal and metal products including builders' hardware); more than 70 establishments are engaged in the manufacture of hosiery and knit goods; other products are clothing, textiles, candy, cigars, shoes, optical goods, etc. There are also large railroad shops. Pop. (1900) 78,961; (1910) 96,071; (1920) 107,784, ranking fourth in the State.

Reagent (rē-ā'jent), in chemical analysis, a substance employed as a test to determine the presence of some other substance. Thus, the infusion of galls is a reagent which detects iron by a dark purple precipitate; the prussiate of potash is a reagent which exhibits a blue with the same metal, etc.

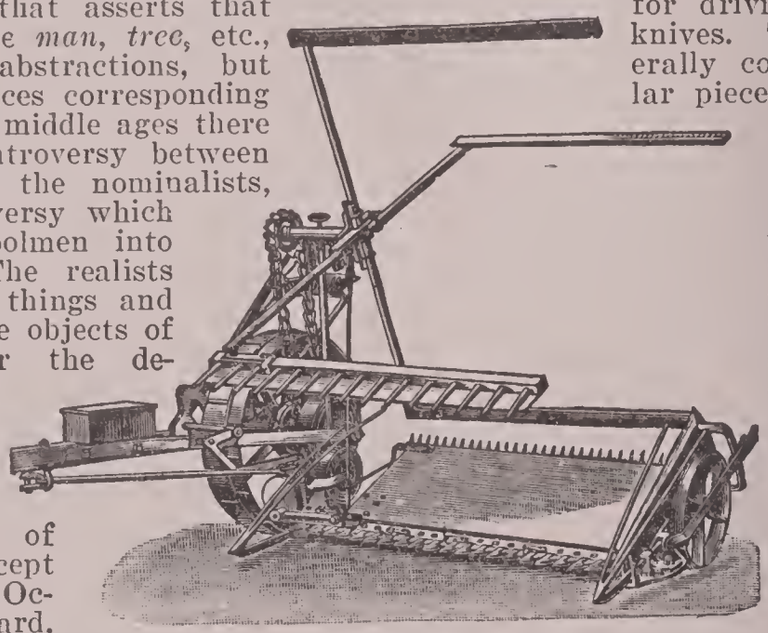
Real (rē'al), in law, pertaining to things fixed, permanent, or immovable. Thus *real estate* is landed property, including all estates and interest in lands which are held for life or for some greater estate, and whether such lands be of freehold or copyhold tenure. So a *real action* is an action brought for

the specific recovery of lands, tenements, and hereditaments.

Real′, a Spanish silver coin worth nearly 5 cents. In the course of exchange 100 reals are rated at $5.00. The real is also a Portuguese money of account, equal to 40 reis, or about 4 cents.

Realgar (rē′al-gȧr), a mineral consisting of a combination of sulphur and arsenic in equal equivalents; red sulphuret of arsenic, which is found native.

Realism (rē′al-izm), in metaphysics, as opposed to *idealism*, the doctrine that there is an immediate or intuitive cognition of external objects, while according to idealism all we are conscious of is our ideas. According to realism external objects exist independently of our sensations or conceptions; according to idealism they have no such independent existence. As opposed to *nominalism*, it is the doctrine that asserts that general terms like *man*, *tree*, etc., are not mere abstractions, but have real existences corresponding to them. In the middle ages there was a great controversy between the realists and the nominalists, the chief controversy which divided the schoolmen into rival parties. The realists maintained that things and not words are the objects of dialectics. Under the denomination of realists were comprehended the Scotists and Thomists, and all other sects of schoolmen, except the followers of Occam and Abelard, who were nominalists.



Single-wheel Back-delivery Reaping-machine.

Real Presence, the doctrine of the actual presence of the body and blood of Christ in the eucharist. See *Consubstantiation*, *Elevation of the Host.*

Real Schools (German, *Realschulen*) are those educational institutions of Germany between the elementary school and the university having for their special object the teaching of science, art, the modern languages, etc., in contradistinction to the ordinary grammar-schools and gymnasiums, in which the classical languages hold a more important place.

Ream (rēm), a quantity of paper, consisting of 20 quires of 24 sheets each. The printer's ream consists of 21½ quires or 516 sheets.

Reaping-hook (rēp′ing), or Sickle, a curved metal blade with a cutting edge on the inner side of the crescent, and set in a wooden handle, used for cutting down corn, grass, etc. It is about 18 inches in length, and tapers from a breadth of about 2 inches at the handle down to a more or less sharp point.

Reaping-machine, or Reaper, a machine for cutting down standing grain, etc., usually worked by a pair of horses, the cutting machinery being driven by being connected with the wheels on which the machine is drawn over the field. The cutting is effected rather in the manner of a pair of scissors than in that of a scythe, and a series of small toothed wheels have to be connected with the main wheel or wheels so as to produce the fast motion necessary for driving the cutting knives. These knives generally consist of triangular pieces of steel riveted to an iron bar, and are sometimes smooth-edged and sometimes tooth-edged. The knife-bar projects horizontally from the side of the machine at a short distance above the ground, and moves backwards and forwards on guides fixed at the back of a number of pointed fingers, which enter the standing grain and guide the straw to the edges of the knives. The motion of the bar being very rapid, the grain is cut down with corresponding speed, and as it is cut it is received on a platform fixed behind the knife-bar. In most cases a revolving rake with four inclined arms is attached to such machines, and set in motion by the driving-wheel. Two of the arms bring the grain well on to the knife-bar, and the others deliver grain cut at the back of the machine. Many of the recent machines are also fitted with a binding apparatus. An endless apron receives the grain as it is cut, and deposits it in a trough on the outer side of the machine. By an ingenious mechanical ar-

rangement the loose straw is caught and compressed by two iron arms; wire from a reel is passed round the sheaf, fastened by twisting, cut away, and the bound sheaf is tossed out of the trough by one of the arms by which it was compressed. For developments of harvesting machinery, including self-binder and corn harvester, see *Agricultural Machinery*.

Reason (rē'zn), a faculty of the mind by which it distinguishes truth from falsehood, and which enables the possessor to deduce inferences from facts or from propositions, and to combine means for the attainment of particular ends. Reason is the highest faculty of the human mind, by which man is distinguished from brutes, and which enables him to contemplate things spiritual as well as material, to weigh all that can be said or thought for and against them, and hence to draw conclusions and to act accordingly. In the language of English philosophy the terms reason and understanding are sometimes nearly identical, and are so used by Stewart; but in the critical philosophy of Kant a broad distinction is drawn between them.

Réaumur (rā-ō-mür), RENÉ ANTOINE FERCHAULT DE, a French physicist and naturalist, born in 1683 at La Rochelle; died in 1757. He is celebrated for the invention of an improved thermometer, which he made known in 1731 (see *Thermometer*), in the scale of which the space between the freezing point and the boiling point of water is divided into 80 degrees. He also discovered the porcelain named from him. His chief work is the *Mémoires pour servir à l'Histoire Naturelle des Insectes*, 1734-42.

Rebate (rē'bāt), the term applied to a discount made to a purchaser in consideration of a cash or prompt payment; in the United States also popularly applied to discriminations made by common carriers in favor of large shippers: It is claimed that many corporations have been built up by secret arrangements with railroad and shipping companies, and that even outside the trusts rebate agreements have been made. Rebates in this restricted sense are illegal in the United States.

Rebec of the sixteenth century.

Rebec (rē'bek), a mediæval stringed instrument somewhat similar to the violin, having properly three strings tuned in fifths, played with a bow. It was of Oriental origin and was introduced by the Moors into Spain.

Rebellion (re-bel'yun), the taking up of arms, whether by natural subjects or others, residing in the country, against a settled government. By international law rebellion is considered a crime, and all persons voluntarily abetting it are criminals, whether subjects or foreigners. When a rebellion has attained such dimensions and organization as to make of the rebel party a state *de facto*, and its acts reach the dimensions of war *de facto*, it is the custom of the state to yield to the rebels such belligerent privileges as policy and humanity require, and to treat captives as prisoners of war, etc.

Rebus (rē'bus), a group of words or a phrase written by figures or pictures of objects whose names resemble in sound the words or the syllables of which they are composed; thus, 'I can see you' might be expressed by pictures of an eye, a can, the sea, and a ewe.

Recall (rē-kal'), in politics, the power of the people to dismiss from office an unsatisfactory public servant. A number of constituents—usually not less than one-fourth—must petition for a recall election, naming some person as successor. Other petitioners may present other names. The election is then held, with the offending officer as one of the candidates. In the United States the principle of recall has been adopted by many cities and a number of states. A number of cities have used the recall against their executives and councilmen, among them Los Angeles, Seattle, Tacoma and Wichita. The chief grounds for the recall are incompetency, corrupt conduct, and failure to respond to the popular will. The advocates of the recall claim that it gives to the people the immediate means of abolishing abuses and makes officers more keenly conscious of their duties as public servants. The related questions of the *Recall of Judges* and *Recall of Decisions* are warmly advocated by those who seek to reform the character of the American judiciary, claiming that the courts have assumed political and legislative power and have shown themselves in sympathy with special privilege more than with the people. The Recall of Decisions is a popular referendum for court declarations that acts of legislature are unconstitutional. It was a prominent issue in the presidential campaign in 1912.

Récamier (rā-kà-mi-ā), JEANNE FRANÇOISE JULIE ADÉLAÏDE, whose maiden name was Bernard,

was born at Lyons in 1777; died in 1849. At the age of sixteen she went to Paris, and was there married to Jacques Récamier, a rich banker, more than double her own age. From this time her aim was to surround herself with personal admirers, and to attract to her salon the chief personages in French literature and politics. Her husband becoming bankrupt, she went to reside with Madame de Staël in Switzerland, but in 1811 was banished from Paris by Napoleon on account of her intimacy with his enemies. At the downfall of Napoleon she returned to Paris and again opened her salon, which as before continued to be a resort of men of intellect till her death. She had very intimate relations with Benjamin Constant and Chateaubriand.

Recanati (rā-ka-nä'tē), a town of Italy, province of Macerata, situated between Ancona and Rome. It contains many fine palaces, a Gothic cathedral, and a monument to Leopardi, who was born here. Pop. 14,590.

Recaption (rē'kap-shun), in law, the retaking, without force or violence, of one's own goods, chattels, wife, or children from one who has taken them and wrongfully detains them.

Receipt (re-sēt'), a written acknowledgment or account of something received, as money, goods, etc. A receipt of money may be in part or in full payment of a debt, and it operates as an acquittance or discharge of the debt only as far as it goes. In Britain if a receipt for a sum of £2 or upwards does not bear the penny government stamp it is inadmissible as evidence of payment. The stamp may be either adhesive or impressed on the paper. In the United States during and after the civil war receipts required internal revenue stamps, but this tax was abolished in 1870.

Receiver (re-sēv'er), a person specially appointed by a court of justice to receive the rents and profits of lands, or the produce of other property, which is in dispute in a cause in that court. The name is also given to a person appointed in suits concerning the estates of infants, or against executors, or between partners in business, or insolvents, for the purpose of winding up the concern.

Receiver of Stolen Goods, one who takes stolen goods from a thief, knowing them to be stolen, and incurs the guilt of partaking in the crime. In the United States the penalty is fixed by statutes in the several States; in Britain, if the theft amounts to felony, it is punished by penal servitude or by imprisonment.

Recent, or Post-Glacial, a geological epoch which extends from the close of the Ice Age (or Pleistocene) to the present day. It is also called the *Human*, as the implements and weapons of man are its most characteristic and important fossils. Nevertheless, there is much evidence to show that in Europe, at least, man existed in Pleistocene time. In America the existence of man has not been so successfully traced. The principal sources of our knowledge of the epoch are the peat bogs, the calcareous formations and red earth of caves, the silt of fresh-water lakes, the gravel terraces of existing rivers, and the finer alluvial deposits.

Rechabite (rek'a-bīt), among the ancient Jews, one of a family or tribe of Kenites whom Jonadab, the son of Rechab, bound to abstain from wine, from building houses, from sowing seed, and from planting vines (see Jer. xxxv. 6, 7). In modern application the Rechabites are a benefit society composed of total abstainers.

Recife (re-sē'fā), or PERNAMBUCO, capital of the state of Pernambuco. The city, called the 'Venice of America,' is located at the mouths of the rivers Beberibe and Capaberibe, lying between the two farther shores of both rivers. It is the nearest South American port to Europe, and has an extensive maritime trade; it is the landing place for two trans-atlantic cables and a coast-line cable. Pop. (1913) 125,000; with suburbs, 225,000.

Reciprocal (re-sip'ru-kal), a term in mathematics. The reciprocal of a quantity is the quotient resulting from the division of unity by the quantity; thus, the *reciprocal* of 4 is ¼, and conversely the *reciprocal* of ¼ is 4; the *reciprocal* of 2 is ½, and that of $a+x$ is $\frac{1}{a+x}$.

Reciprocity (res-i-pros'i-ti), a term in economics commonly applied in international relationships to the arrangement whereby two nations mutually agree to import to each other certain goods, either duty free or with duties which are equivalent. It has been frequently applied of late years in tariff relations between the United States and other countries, and in the Tariff bill of 1909 is a maximum and minimum clause as a means of obtaining trade concessions from foreign countries, on the reciprocal principle of granting similar concessions. A bill in favor of reciprocity in trade

with Canada was passed by Congress in 1911, but the measure was rejected by Canada. See *Free-trade*.

Recitative (res-i-ta-tēv'), a species of vocal composition which differs from an air in having no definite rhythmical arrangement, and no decided or strictly constructed melody, but approaches in tonal succession and rhythm to the declamatory accents of language. It is used in operas, oratorios, etc., to express some action or passion, or to relate a story or reveal a secret or design. There are two kinds of recitative, *unaccompanied* and *accompanied*. The first is when a few occasional chords are struck by an instrument or instruments to give the singer the pitch, and intimate to him the harmony. The second, which is now the more common, is when all, or a considerable portion, of the instruments of the orchestra accompany the singer.

Reclamation (rek-la-mā'shun), the reclaiming to fertility of arid and semi-arid lands. A reclamation act was passed by the United States government in 1902, under which the government is building irrigation works and selling the water thus obtained to settlers at prices sufficient to repay the cost of construction, the funds set aside for this purpose being the receipts from the sale of public lands. As a result about $60,000,000 has been received and $48,000,000 spent up to 1910. The total cost of all irrigation projects now in view is estimated at about $120,000,000, and the amount of land to be reclaimed over 3,000,000 acres. The cost per acre is less than $40.

Reclus (rė-klü), Jean Jacques Élisée, a French geographical writer, born in 1830. He left France in 1851 and spent several years in travel, afterwards publishing a great number of works, the results of his voyages and geographical researches. Among his chief works are *La Terre*, the English edition of which, *The Earth*, has been very popular, and an exhaustive *Géographie Universelle*, which, voluminous as it is, he lived to complete. Being an extreme democrat, he became involved in the Paris commune of 1871, and was sentenced to transportation for life, but was amnestied in 1879. He earned a certain notoriety from his extreme views on social questions. He died July 4, 1905. He had three brothers, two of them writers of some distinction and one a distinguished surgeon of Paris, and three sisters who engaged in literary work.

Recognizance (re-kog'ni-zans), in law, an obligation of record which a man enters into before some court of record, or magistrate duly authorized, with particular conditions; as to appear at the assizes or quarter-sessions, to keep the peace, etc.

Recollet (rek'o-lā), or Rec'ollect, Friars or Nuns, the name given to a reformed body of Franciscans. The society was founded in Spain, and thence spread throughout Europe, so that in France, before the Revolution, they had 168 houses. The order still exists at a few places.

Reconnaissance (rē-kon'ā-sâns), in military affairs, an examination of a territory or of an enemy's position, for the purpose of directing military operations. In future wars flying machines are likely to be used for this purpose. The term is also used in geodetics, etc., a reconnaissance being an examination of a region as to its general natural features, preparatory to a more particular survey, as for determining the location of a road, a railway, a canal, or the like.

Record (rek'ord), specifically, an official copy of any writing, or account of any facts and proceedings, whether public or private, entered in a book for preservation. In a popular sense the term *records* is applied to all public documents preserved in a recognized repository. The public records of England have been regularly preserved since 1100. In 1857 the master of the rolls began the publication of the valuable series of chronicles and memorials known as the Rolls Series. The records or archives of the United States are easily accessible, and proper recommendation will open them to any one who wants to use them for scientific purposes. In the legal sense of the term *records* are authentic testimonies in writing of judicial acts and proceedings, contained in rolls of parchment and preserved, the courts of which the proceedings are thus preserved being called *courts of record*. In Scots law the record consists of the written statements or pleadings of parties in a litigation, and the 'closing of the record' is a formal step, sanctioned by the judge, after each party has put forward all he wishes to say by way of statement and answer.

Recorder (re-kor'dėr), in England, the chief judicial officer of a borough or city, exercising within it, in criminal matters, the jurisdiction of a court of record, whence his title is derived. The appointment of recorders is

vested in the crown, and the selection is confined to barristers of five years' standing. The same name is given to similar legal functionaries elsewhere, as in some American cities.

Recorder, a musical instrument, formerly much used, resembling a flageolet in shape. The instrument was wider in the lower half than in the upper; its tones were soft and pleasing, and an octave higher than the flute.

Recruiting. See *Enlistment.*

Rectangle (rek'tang-gl), a right-angled parallelogram, or a quadrilateral figure having all its angles, right angles and its opposite sides equal. Every rectangle is said to be *contained* by any two of the sides about one of its right angles.

Rectify (rek'ti-fī), in chemistry, to refine by repeated distillation or sublimation, by which the fine parts of a substance (as some kind of spirits) are separated from the grosser. To rectify liquors, in the spirit trade, is to convert the alcohol produced by the distiller into gin, brandy, etc., by adding flavoring materials to it. Thus in order to convert the spirit into London gin, juniper berries and coriander seeds are added previous to the last rectification. Œnanthic ether and other things give the flavor of brandy.

Rector (rek'tur), in the English Church, a clergyman who has the charge and cure of a parish, and has the parsonage and tithes; or the parson of a parish where the tithes are not impropriate. The heads of Exeter and Lincoln colleges, Oxford, are also so-called, and the chief elective officer of the Scottish universities receives the same title. In Scotland it is also the title of the head-master of an academy or important public school.

Rectum (rek'tum), in anatomy, the third and last part of the large intestine opening at the anus: so named from an erroneous notion of the old anatomists that it was straight.

Recurring Series (re-kur'ing), in algebra, a series in which the coefficients of the successive powers of x are formed from a certain number of the preceding coefficients according to some invariable law. Thus $a + (a+1)\,x + (2a+2)\,x^2 + (3a+3)\,x^2 + (5a+5)\,x^2 + \ldots$ is a recurring series.

Recusant (rek'ū-zant), in English history, after the Reformation, a person who refused or neglected to attend divine service on Sundays and holidays in the Established Church, or to worship according to its forms. Heavy penalties were formerly inflicted on such persons, but they pressed far more lightly on the simple recusant or nonconformist than on the Roman Catholic recusant. In 23 Elizabeth the fine was made for every month £20; and later in the same reign it was enacted that if recusants did not submit within three months after conviction they might, upon the requisition of four justices of the peace, be compelled to abjure and renounce the realm; and if they did not depart, or if they returned without due license, they were to be treated as felons, and suffer death without benefit of clergy.

Red, one of the primary colors, the color of that part of the spectrum which is farthest from the violet. The red rays are the least refrangible of all the rays of light. (See *Color.*) Red pigments or coloring matters include vermilion, realgar, cochineal, lakes and madders, coal-tar colors, etc. The different forms of oxide of iron are *Indian red*, which is pure, finely ground hæmatite; *Venetian red* and *colcothar*, which are coarser forms of the same substance. *Minium* or lead oxide, and another form of the same substance containing a little carbonate, are known as *Paris red.*

Red Admiral Butterfly (*Vanessa Atalanta*), the popular name of a common butterfly. The anterior wings are marked by a broad red band, outside of which are six white markings, while a bluish streak follows the wing-margin. The posterior wings are bordered with red, dotted with black spots, and have two bluish markings.

Redan (re-dan'), in field fortification, the simplest kind of work employed, consisting of two parapets of earth raised so as to form a salient angle, with the apex towards the enemy and unprotected on the rear.

Redans.

Several redans connected by curtains form lines of intrenchment.

Red Bank, a borough of Monmouth Co., New Jersey, on the Shrewsbury River, 26 miles S. of New York. It has manufactures of automobiles, boilers, carriages, etc. Also a summer resort. Pop. 9251.

Red-bird, the popular name of several birds in the United States, as the cardinal, the scarlet tanager, and the summer tanager, or red-bird (*Piranga rubra*).

Red-book, a book containing the names of all the persons in the service of the English government. The *red-book of the exchequer* is an ancient English record in which are registered the names of all that held lands per baroniam in the time of Henry II.

Redbreast, or ROBIN REDBREAST (*Erythăcus rubecŏla*), a species of bird belonging to the tentirostral section of the Insessores, and to the family Sylviadæ, or warblers. The red breast of the male is the distinguishing feature of these well-known birds, the female possessing the breast of a duller yellowish-brown color. The young are of a dull yellowish-green color, and want the characteristic breast-coloring of the adult. In Britain the redbreast is a permanent resident, but in more northern countries it appears to be migratory, flying southwards in winter. It is a permanent bird in all the temperate parts of Europe, and it also occurs in Asia Minor and in North Africa. The nest is made of moss and leaves, and is lined internally with feathers. The eggs number five or six, and are white, spotted with pale brown. The robin redbreast of America is a thrush, the *Merŭla migratoria*, congeneric with the British blackbird; and one of the bluebirds, the *Sialia sialis*, is usually called the blue robin. The species of the Australian genus *Petræca*, allied to the wheatears, and remarkable for their bright plumage, are called robins.

Red Cedar, a species of juniper (*Jŭnipĕrus virginiāna*), found in the United States and the West Indies; the heartwood is of a bright red, smooth, and moderately soft, and is in much request for the wooden covering of black-lead pencils. The demand for this purpose is so great that the tree is becoming very scarce.

Red Chalk. See *Reddle.*

Red Cloud, a noted chief of the Sioux Indians, born about 1820, and the last of the famous chiefs of the Sioux nation. He first came into notice as the leader in the Fetterman massacre of 1866 in Wyoming, when 100 men commanded by Captain Fetterman were surrounded and all killed. Made leader of the Sioux warriors, he became a terror to the whites in the region where he ruled, making frequent raids and committing many depredations. After the battle of Wounded Knee, in 1890, he and his followers stampeded to the hills. In his later years he was kept at the Pine Ridge Agency, where he died December 10, 1909, about 90 years of age.

Red Coral (*Corallium rubrum*), an important genus of sclerobasic corals belonging to the order Alcyonaria. Red coral is highly valued for the manufacture of jewelry, and is obtained from the coasts of Sicily, Italy, and other parts of the Mediterranean.

Red Cross Societies, benevolent associations established immediately after the Geneva Convention of 1863 for the purpose of assisting the wounded in time of war. A central international committee maintains the connection between the various societies. The distinctive badge of the societies is a red Greek cross on a white ground. Since their institution they have done much to alleviate the horrors of war and have lent their aid in disasters of various kinds. (See *Geneva Convention.*) An association bearing the title of the American National Red Cross was incorporated by Congress in 1904, on the lines of the Geneva Red Cross Society of 1863. During the European war (*q. v.*) the American branch of this organization became marvelously active, bringing relief to every nation engaged in warlike operations. Before the entry of the United States into the war money and supplies valued at $4,000,000 had been contributed for this work and within six months thereafter an additional fund of over $100,000,000 had been raised. The membership, 280,000 on Dec. 1, 1916, had become more than 3,500,000 in Sept., 1917, while 12,000 nurses were enrolled. The headquarters of the society were at Washington, with Woodrow Wilson as president and William H. Taft as vice-president, but in every town and village of the United States materials for the use of the society were being diligently prepared, while throughout the warring countries of Europe the agents of the society were everywhere engaged in the work of relief.

Red Currant (*Ribes rubrum*), a deciduous shrub much cultivated for its fruit, indigenous in the northern portions of Enrope and America. The juice of the fruit is used for making jelly, and a well-known fermented liquor called currant wine.

Red-deer. See *Stag.*

Redditch (red'dich), a town of England, county of Worcester, 12½ miles S. S. W. of Birmingham. It is irregularly but generally well built, and has manufactures of needles, hooks and eyes, and fishing-tackle. Pop. 15,463.

Redemption (re-dem'shun), in theology, the purchase of God's favor by the sufferings and death of Christ; the ransom or deliverance of sinners from the bondage of sin and the penalties of God's violated law by the atonement of Christ.

Redemption, EQUITY OF. See *Equity.*

Redemptorists (re-demp'tor-istz), a religious congregation founded in Naples by Liguori in 1732. They devote themselves to the education of youth and the spread of Roman Catholicism. They style themselves members of the congregation of the Holy Redeemer. By the law of 1872 they were expelled from Germany, and in the year 1880 France treated them in the same manner. They are also called *Liguorists.*

Red-fish, a species of fish (*Sebastes marĭnus*) found on the Atlantic coast of North America, a large red fish caught in considerable numbers for food. A smaller species (*S. vivipărus*) receives the same name, and is called also *Red-perch, Rose-fish,* etc. The bergylt (which see) is closely akin.

Redgrave (red'grāv), RICHARD, born in London in 1804; became a student of the Royal Academy in 1826; his first notable picture was *Gulliver at the Farmer's Table;* in 1840, when he exhibited *The Reduced Gentleman's Daughter,* he was elected an Associate, and in 1851 became a Royal Academician. He produced other valuable paintings and from being headmaster of the Government School of Design he became inspector-general of art schools, and arranged the Museum of Art at South Kensington. He was joint author with his brother of *A Century of Painters* (1866.) Among his later pictures were *Sermons in Stones* (1871); *The Oak of the Mill Head* (1876); *Friday Street, Wotton* (1878); and *Hidden Among the Hills* (1881). He died Dec. 14, 1888.—His brother SAMUEL, born 1802; died 1876, is chiefly known for his *Dictionary of Artists of the British School.*

Red Gum, the popular name of a florid eruption usually occurring in infants before and during first dentition, and appearing on the most exposed parts, as the face, neck, arms, and hands. It is almost always an innocent disease, and seldom lasts over a month.

Red Gum-tree, one of the Australian Eucalypti (*Eucalyptus resinifĕra*), yielding a gum-resin valued for medicinal uses.

Red Hand, in heraldry, originally the arms of the province of Ulster, but granted to baronets as their distinguishing badge on the institution of the order in 1611. It consists of a sinister (or left) hand, open, erect, showing the palm.

Red Indians. See *Indians.*

Redlands, a city in San Bernardino Co., California, 8 miles S. E. of San Bernardino. It is in the center of the orange country and has canning and packing industries, etc. Also a mountain resort. Pop. 9571.

Red-lead (Pb_3O_4), an oxide of lead produced by heating the protoxide in contact with air. It is much used as a pigment, and is commonly known as *Minium.*

Red-Men, IMPROVED ORDER OF, a social and benevolent organization founded in the United States in 1763, and again in 1834. It is based on the customs of the American aborigines and is the oldest society of its kind founded in the United States. The order is composed of subordinate bodies called tribes, officered by sachems, sagamores, prophets, etc. There are over 5200 of these tribes, with a membership of nearly 500,000.

Redmond, JOHN EDWARD, Irish statesman, born at Waterford in 1851, became a barrister at Gray's Inn 1886, and in Ireland 1887. He was a member of Parliament from New Ross, 1881-85; North Wexford, 1885-91, and Waterford since 1891. He was leader of the Irish Nationalist party and under his leadership the Home Rule Bill was passed in 1914, but was postponed during the war. He died Mar. 6, 1918.

Red Oak, county seat of Montgomery Co., Iowa, 54 miles by rail E. of Omaha. It has ironworks, flour mill, pipe works, etc. Pop. (1920) 5578.

Red Ochre, a name common to a variety of pigments, rather than designating an individual color, and comprehending Indian red, light red, Venetian red, scarlet ochre, Indian ochre, reddle, bole, and other oxides of iron. As a mineral it designates a soft earthy variety of hæmatite.

Redondillas (red-on-dil'yas), the name given to a species of versification formerly used in the south of Europe, consisting of a union of verses of four, six, and eight syllables, of which generally the first rhymed with the fourth and the second with the third. At a later period verses of six and eight syllables in general, in Spanish and Portuguese poetry, were called *redondil-*

las, whether they made perfect rhymes or assonances only.

Red Orpiment. Same as *Realgar*.

Redout (re-dout'), in fortification. a general name for nearly every class of works wholly inclosed and undefended by reëntering or flanking angles. The word is, however, most generally used for a small inclosed work of various form — polygonal, square, triangular, or even circular, and used mainly as a temporary field work.

Red Pine, a species of pine (*Pinus rubra*), also called *Norway Pine*. Its wood is very resinous and durable, and is much used in house and ship-building. It produces turpentine, tar, pitch, resin, and lampblack.

Red-pole, RED-POLL, a name given to several species of linnets. The greater redpole is the *Linōta cannabĭna;* the mealy red-pole is the *L. borcālis* or *canescens;* and the little redpole is the *L. linaria*. The same name is given to the *Sylvicŏla petechia* of America, also called the *red-headed warbler* and *yellow red-pole*.

Red River, a large river of the United States, the southernmost of the great tributaries of the Mississippi. It rises in northern Texas, and has several sources, the chief, besides the main stream, being called the North and South Forks, which unite with it on the boundary line between Texas and eastern Oklahoma. The stream then flows E. S. E., forming the boundary between Texas, Oklahoma and Arkansas; cuts off a corner of the latter state, and then flowing through Louisiana, falls into the Mississippi, 125 miles northwest of New Orleans; total course estimated at 1550 miles; chief affluents — the Washita, which joins it in Louisiana. and the False Washita, which it receives in Oklahoma. Much of its course is through rich prairies. About 1200 miles of the river are useful for navigation, but its mouth at low water can be entered only by boats drawing 2 feet.

Red River, or SONG-KA, a large river of Tonquin, formed by the junction of the Leteën and Songshai, the former rising in China, the latter in Laos. It flows S. E., passes Hanoi, and falls by several mouths into the Gulf of Tonquin.

Red River of the North, a river of North America, which rises in Elbow Lake, in Minnesota, flows south and southwest, and then nearly north, crossing from the United States into Manitoba, where it falls into Lake Winnipeg. Its entire length is 665 miles, 525 of which are in the United States. In Manitoba it receives the Assiniboine, another large stream, at its junction with which stands the town of Winnipeg.

Red River Settlement, a settlement formed in 1812 in Canada by the Earl of Selkirk on the banks of the above river; repurchased by the Hudson's Bay Company in 1836; finally transferred to the Canadian government in 1870, and now made part of the province of Manitoba.

Red Root, a name given to several plants, one of them *Ceanōthus Americānus*, natural order Rhamnaceæ. It has simple alternate leaves and large red roots, and is found in North America, where the leaves are used sometimes to make an infusion of tea.

Redruth (red'ruth), a market town of England, county of Cornwall, 9½ miles northwest of Falmouth. The inhabitants are principally employed in the tin and copper mines of the neighborhood. Pop. (1911) 10,815.

Red Sea, or ARABIAN GULF, a branch of the Indian Ocean, communicating with it by the Strait of Bab-el-Mandeb, stretching in a N. N. W. direction between Arabia on the east, Abyssinia, Nubia, and Egypt on the west, and connected with the Mediterranean on the north by the Suez Canal. It forms a long and narrow expanse, stretching for 1450 miles, with a breadth which averages about 180 miles, but diminishes gradually at its extremities. At the northern end it divides into two branches, one of which, forming the Gulf of Akaba, penetrates into Arabia for about 100 miles, with an average breadth of about 15 miles; while the other, forming the Gulf of Suez, penetrates between Arabia and Egypt for about 200 miles, with an average breadth of about 20 miles. The shores consist generally of a low, sandy tract, varying in width from 10 to 30 miles, and suddenly terminated by the abutments of a lofty table-land of 3000 feet to 6000 feet high. Occupying a long deep valley this water expanse has gradually been divided into three channels formed by coral reefs and islands. In the main channel the depth reaches in one place 1054 fathoms, but diminishes towards the extremities to 40 fathoms, while in the harbor of Suez it amounts to only 3 fathoms. From October to May, when the wind sets steadily from the south, a strong current flows in from the Strait of Bab-el-Mandeb: while from May to October. the

north wind continues to blow, which gives the current a southern direction. The result of this is to raise the sea-level by several feet north and south alternately. The atmosphere is excessively hot in the warm season. The principal harbors of the Red Sea are, on the African coast, Suez, Kosseir, Suakin, and Massowa; and on the Arabian coast, Jedda (the port of Mecca), Hodeida, and Mocha. The cross trade consists chiefly of slaves from Africa and pilgrims to Mecca, but the through traffic has been immensely increased by the Suez Canal. The Israelites are supposed to have crossed the Red Sea at its northern extremity in the Gulf of Suez, and near the town of that name, but opinions vary as to the precise spot.

Redshank, a bird of the genus *Totănus*, the *T. calidris*, so called from its red legs. It is about 11 inches long, and is known as a summer bird of passage in the northern parts of Europe and Asia, occurring in winter as far south as India. The spotted redshank (*T. fuscus*) visits Northern Europe in its spring and autumn migrations.

Red-snow. See *Protococcus*.

Redstart, a bird (*Ruticilla phœnicŭra*) belonging to the family Sylviadæ, nearly allied to the redbreast, but having a more slender form and a more slender bill. It is found in almost all parts of Britain as a summer bird of passage, and has a soft sweet song. The tail is red, whence the

Redstart (*Ruticilla phœnicūra*).

name, *start* being Anglo-Saxon *steort*, a tail. The forehead is white, the throat black, the upper parts lead-gray or brown. The black redstart (*Phœnicura tithys*) is distinguished from the common redstart by being sooty black on the breast and belly where the other is reddish brown. The American redstart is a small bird of the family Musicapidæ or fly-catchers, common in most parts of North America.

Red-top, a well-known species of bent-grass, the *Agrostis vulgāris*, highly valued in United States for pasturage and hay for cattle. Called also *English Grass* and *Herd's-grass*.

Reductio ad absurdum, a species of argument much used in geometry, which proves not the thing asserted, but the absurdity of everything which contradicts it. In this way the proposition is not proved in a direct manner by principles before laid down, but it is shown that the contrary is absurd or impossible.

Reduction (re-duk'shun), in arithmetic, the bringing of numbers of one denomination into another, as farthings to shillings, or shillings to farthings; pounds, ounces, pennyweights, and grains to grains, or grains to pounds.

Red-water, a disease of cattle, and occasionally of sheep, in which the appetite and rumination become irregular, the bowels speedily become constipated, and the urine reddened with broken-down red globules of blood. It is caused by eating coarse, indigestible, innutritive food, by continued exposure to inclement weather, and other causes which lead to a deteriorated state of the blood. Called also *Bloody Urine*, *Hæmaturia*, and *Moor-ill*.

Redwing, a species of thrush (*Turdus iliăcus*), well known as a winter bird of passage. It spends the summer in the northern parts of Europe and Asia, its winter range extending to the Mediterranean. It is about equal to the song thrush in size, congregates in large flocks, and has an exquisite song.

Red Wing, a city, county seat of Goodhue Co., Minnesota, on the Mississippi, 41 miles S. E. of St. Paul. It has a city hall, Lutheran Ladies' Seminary, Red Wing Seminary, State Training School, etc. Shipping point for wheat, and has flour mills, furniture and motor factories, etc. Pop. 8637.

Red-wood, the name of various sorts of wood of a red color, as an Indian dyewood, the produce of *Pterocarpus santalīnus;* the wood of *Gordonia Hæmatoxylon*, the red-wood of Jamaica; that of *Pterocarpus dalbergioides*, or Andaman wood; that of *Ceanōthus colubrīnus*, the red-wood of the Bahamas; that of *Sequoia sempervirens*, a coniferous tree of California, the red-wood of the timber trade; that of *Soymida febrifuga*, of which the bark is used in India for fevers, and has been employed successfully in Europe for typhus. The Californian red-wood is the

best known. The tree reaches a very great size, and forms forests in the coast mountains of California. It is closely related to the giant trees of California. The red-wood trees range from 4 to 6 feet in diameter. The lumber from it is of a deep red color, takes a beautiful polish, and is much valued for decorative purposes.

Ree, Lough, a lake of Ireland, formed by the Shannon, between the counties of Longford, Westmeath, and Roscommon, 17 miles long and 1 mile to 6 miles broad, studded with islands.

Reebok (rā'bok; that is roebuck), a species of South African antelope, the *Antilŏpe capreŏlus*. The horns are smooth, long, straight, and slender. The reebok is 2½ feet high at the shoulder, of a slighter and more graceful form than the generality of other antelopes, and extremely swift.

Reed (rēd), a name usually applied indiscriminately to all tall, broad-leaved grasses which grow along the banks of streams, pools, and lakes, and even to other plants with similar leaves, growing in such situations, as the bamboo. Strictly speaking, however, it is the name given to plants of the genera *Arundo*, *Psamma*, and *Phragmītes*, and especially to *Phragmītes communis* (the common reed). This, the largest of all the grasses of northern climates, is used for roofing cottages, etc. It is exceeded in size by the *Arundo donax* of Southern Europe, which sometimes grows to the height of 12 feet. The sea-reed or matgrass (*Ammophila* (or *Psamma*) *arenaria*) is often an important agent in binding together the masses of loose sand on sea-shores. The bur-reed (reed-grass) is of the genus *Sparganium* of the reed-mace order. See *Reed-mace*.

Reed, in music, a vibrating slip or tongue in the mouthpiece through which a hautboy, bassoon, or clarinet is blown, originally made of reed; or one of the thin plates of metal whose vibrations produce the notes of an accordion, concertina, or harmonium, or a similar contrivance in an organ-pipe.

Reed, Sir Edward James, naval architect, born in 1830. He was at one time connected with Sheerness dockyard, and having become an authority on naval architecture he was appointed chief constructor to the navy, for which he designed a number of iron-clads and other vessels. He wrote several books on naval subjects. Died in 1906.

Reed, Thomas Brackett, statesman, was born in Portland, Maine, Oct. 19, 1839. He graduated at Bowdoin in 1860 and studied law. He was a member of the Maine legislature 1868-70 and attorney-general of the state 1870-72. In 1876 he was elected to Congress, and was Speaker of the House for three terms. As such he proved an able parliamentarian, and became widely known for his energy and arbitrary decision in 1890 of counting a quorum of members present despite their declining to vote. This decision as to actual presence and constructive absence made him bitter enemies, but was sustained by the Supreme Court. He resigned in 1899 and engaged in legal business in New York, where he died Dec. 6, 1902.

Reed Bird. See *Rice Bunting*.

Reed-mace (rēd-mās), a plant of the genus *Typha*, natural order Typhaceæ. Two species are common, *T. latifolia*, or greater reed-mace, and *T. angustifolia*, the lesser. These plants are also known by the name of *cat-tail*, and grow in ditches and marshy places, and on the borders of ponds, lakes, and rivers. They are tall, stout, erect plants, sometimes 6 or 8 feet high, with creeping root-stocks, long flag-like leaves, and long dense cylindrical brown spikes of minute flowers. They are sometimes erroneously called bulrush.

Reef (rēf), a certain portion of a sail between the top or bottom and a row of eyelet-holes running across the sail, one or more reefs being folded or rolled up to contract the sail in proportion to the increase of the wind. There are sets of cords called *reef-points* attached to the sail for tying up the reefs,

Wherry with fore-sail reefed, the main-sail showing reef-bands and reef-points.

and the sail is also strengthened by *reef-bands* across it. There are several reefs parallel to each other in the superior sails, and there are always three or four reefs parallel to the foot or bottom of

the chief sails which are extended upon booms. Many ships are now fitted with sails which can, by a mechanical appliance, be reefed from the deck.

Reef, a chain, mass, or range of rocks in various parts of the ocean, lying at or near the surface of the water.

Reel (rēl), a machine on which yarn is wound to form it into hanks, skeins, etc. Also a skeleton barrel attached to the butt of a fishing-rod, around which the inner end of the line is wound, and from which it is paid out as the fish runs away when first hooked.

Reel, a lively dance originating in Scotland, in one part of which the couples usually swing or whirl round, and in the other pass and repass each other, forming the figure 8. The music for this dance, called by the same name, is generally written in common time of four crotchets in a bar, but sometimes in jig time of six quavers. A variation of this dance, known as the Virginia Reel, is popular in the United States.

Reem (rēm), the Hebrew name of an animal mentioned in Job xxxix, 9, and translated as unicorn. There is little doubt that a two-horned animal was intended by the name, and the common belief now is that the reem was the aurochs or urus.

Re-entry (rē-en'tri), in law, the resuming or retaking the possession of lands lately lost. A *proviso for re-entry* is a clause usually inserted in leases, that upon non-payment of rent, etc., the term shall cease

Rees (rēs), ABRAHAM, editor, was born in Wales in 1743; died in 1825. He was educated at Hoxton Academy, where he remained as tutor for over twenty years; became pastor of a Presbyterian church in Southwark, and afterwards in the Old Jewry. He edited E. Chambers's Cyclopedia (1776-86); and used this as the basis of a larger and very valuable work called Rees's Cyclopedia (1802-19, 45 vols.).

Reeve (rēv), the name given to the female of the bird called the ruff. See *Ruff*.

Reeve, the title of the official, existing in early times in England, who was appointed by the king to carry into execution the judgments of the courts presided over by the ealdorman (earl) and other high dignitaries, to levy distresses, exact the imposts, contributions, tithes, and take charge of prisoners.

Reeves, JOHN SIMS, tenor singer, born at Shooters' Hill, Kent, in 1822; appeared as a baritone on the stage at Newcastle in 1839, and for many years afterwards was very popular. He devoted himself more especially to oratorio and ballad singing, and long held the reputation of being the first of modern tenors. He published an autobiography in 1889. He died October 25, 1900.

Reference (ref'er-ens), in law, the process of assigning a cause depending in court, or some particular point in a cause for a hearing and decision, to persons appointed by the court.

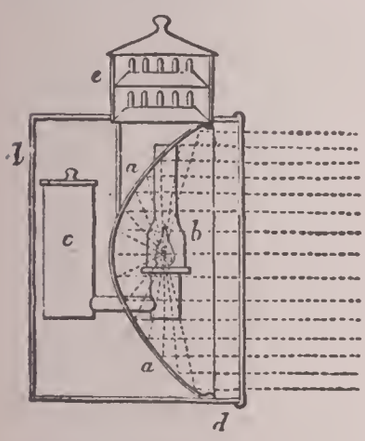
Referendum (ref-er-en'dum), a term used in the Swiss Confederation to denote the reference to the citizen voters of resolutions or laws passed by their representatives. If these, when so referred, are accepted by the majority of the voters of the canton, then they become part of the law of the land; but if they are rejected, then the rejection is final. The referendum is obligatory when the law or resolution affects the constitution; in other cases it is optional. The referendum has long been used in the United States for several purposes, such as the adoption of constitutions and of amendments to constitutions. As a constitutional provision giving the people the right to control and revise general legislation it was first adopted by South Dakota in 1898, and by Oregon in 1902. Since these dates other states have adopted it, the number up to January 1, 1911, being ten, though of these only five had effective measures, the others being in various ways incomplete or defective. The question of referendum amendments to state constitutions was a prominent issue in 1911. While defeated in most cases, it was adopted by California and in the new constitutions of Arizona and New Mexico Up to the date named it had been fairly tried only in Oregon, its operation there being viewed as very satisfactory. This state alone has adopted an effective system of informing the electors concerning the measures to be submitted to popular vote, a pamphlet containing an official copy of the measure, together with arguments for and against it, being mailed to every voter prior to the election. See INITIATIVE AND REFERENDUM.

Refining of Metals, the processes by which the various metals are extracted from their ores, and obtained in a state of purity. See the articles on the several metals.

Reflection (re-flek'shun), specifically, in physics, the change of direction which a ray of light, radiant heat, sound, or other form of radiant

energy, experiences when it strikes upon a surface and is thrown back into the same medium from which it approached. When a perfectly elastic body strikes a hard and fixed plane obliquely it rebounds from it, making the angle of reflection equal to an angle of incidence. This is also the case with light, but the light undergoes the change known as polarization. See *Polarization, Optics.*

Reflector (re-flek'tur), a polished surface of metal, or any other suitable material, applied for the purpose of reflecting rays of light, heat, or sound in any required direction. Reflectors may be either plane or curvilinear; of the former the common mirror is a familiar example. Curvilinear reflectors admit of a great variety of forms, according to the purposes for which they are employed; they may be either convex or concave, spherical, elliptical, parabolic, or hyperbolic, etc. The parabolic form is perhaps the most generally serviceable, being used for many purposes of illumination, as well as for various highly important philosophical instruments. The annexed cut is a section of a ship lantern fitted with an argand lamp and parabolic reflector. *a a* is the reflector, *b* the lamp, situated in the focus of the polished concave paraboloid, *c* the oil cistern, *d* the outer frame of the lantern, and *e* the chimney for the escape of the products of combustion. See *Optics, Lighthouse.*



Parabolic Reflector.

Reflexive Verb, in grammar, a verb which has for its direct object a pronoun which stands for the agent or subject of the verb, as I *bethought myself;* the witness *forswore himself.* Pronouns of this class are called *reflexive pronouns,* and in English are generally compounds with *self;* as, to deny *one's self;* though such examples also occur as: 'He bethought *him* how he should act'; 'I do repent *me.*'

Reflex Nervous Action, in physiology, those actions of the nervous system whereby an impression is transmitted along sensory nerves to a nerve center, from which again it is reflected to a motor nerve, and so calls into play some muscle whereby movements are produced. These actions are performed involuntarily, and often unconsciously, as the contraction of the pupil of the eye when exposed to strong light. See *Nerve.*

Reform (rē-form'), Parliamentary. See *Britain, History.*

Reformation (ref-ur-mā'shun), the term generally applied to the religious revolution in the sixteenth century which divided the Western Church into the two sections known as Roman Catholic and the Protestant. Before this era the pope exercised absolute authority over the whole Christian Church with the exception of those countries in which the Greek or Eastern Church had been established. He also had an influence in temporal affairs wherever his spiritual authority was recognized. Various abuses in discipline sprung up in the Church, and attention had often been called to these both by laymen and clerics. An important movement in the direction of a reformation was begun by Wickliffe (1324-84) in England, a movement which, on the Continent, was developed by Huss (1369-1415) and Jerome of Prague (1360-1416) with their Bohemian followers. But the times were not ripe for combined opposition. New and powerful influences, however, were soon at work. The Renaissance increased the number of scholars; the new art of printing diffused knowledge; while the universities gave greater attention to the Greek and Hebrew languages, and grew in numbers. Much of the intellectual force and fearlessness brought forth by the Renaissance was turned against the corrupt practices referred to. In the writings of Erasmus (1467-1536), as well as in a host of satires, epigrams, etc., the ecclesiastics of the time were held up to a derision which thoughtful men recognized as just. The condition of the Western Church, indeed, was such that a reformation of some kind was now inevitable. The great movement usually known as the Reformation was started by Martin Luther, an Augustine monk of Erfurt, professor of theology in the University of Wittenberg; and what immediately occasioned it was the preaching of indulgences in Germany by a duly accredited agent, Johann Tetzel, a Dominican monk of Leipzig. Luther condemned Tetzel's methods, first in a sermon and afterwards in ninety-five theses or questions which he affixed to the door of the great church, October 31, 1517. This at once roused public interest and gained him a number of adherents, among them men of influence in church and

state. Luther urged his spiritual superiors and the pope to put a stop to the doings of Tetzel and to reform the corruptions of the church in general. In consequence a heated controversy arose, Luther was fiercely assailed, and in 1520 excommunication was pronounced against him by Pope Leo X. (See *Luther.*) Upon this the dissenter appealed to a general council; and when his works were burned at Mainz, Cologne, and Louvain, he publicly committed the bull of excommunication with the papal canons and decrees to the flames (December, 1520). From this time Luther formally separated from the existing Church, and many of the principal German nobles, Hutten, Sickingen, Schaumburg, etc., some very eminent scholars, and the University of Wittenberg, publicly declared in favor of the reformed doctrines and discipline. Luther's bold refusal to recant at the Diet of Worms (April 17th, 1521) gave him increased power, while the edict of Worms and the ban of the emperor made his cause a political matter. By his ten months' seclusion in the Wartburg, after the Diet of Worms, Luther was secured from the first consequences of the ban of the empire, and the emperor was so much engaged by French and Spanish affairs that he almost wholly lost sight of the religious ferment in Germany.

Leo's successor, Adrian VI, now considered it necessary to interfere, but in answer to his demand for the extirpation of the doctrines of Luther he received a list of a hundred complaints against the papal chair from the German states assembled at the Diet of Nürnberg (1522). While Luther was publishing his translation of the New Testament, which was soon followed by the translation of the Old; and while Melanchthon was engaged on his *Loci Communes* (the first exposition of the Lutheran doctrines) serious preparations for the reform of ecclesiastical abuses were made in Pomerania, Silesia, in the Saxon cities, in Suabia, etc., and the Reformation made rapid progress in Germany. Luther's *Liturgy* had no sooner appeared (1522), than it was adopted in Magdeburg and elsewhere. New translations of the Bible into Dutch and French appeared, and at Meux in France a Lutheran church was organized. In vain did the Sorbonne condemn the principles of Luther, and powers political and ecclesiastical endeavor to stop this movement. In 1525 John, the successor of Luther's first patron Frederick in the Saxon electorate, Philip, landgrave of Hesse, and Albert of Brandenburg, duke of Prussia publicly declared themselves Lutherans. Aided in great measure by the state of political affairs, the movement continued to spread rapidly. In these circumstances the emperor convened the Diet of Augsburg (June, 1530), at which Melanchthon read a statement of the reformed doctrine, now known as the *Confession of Augsburg.* The Catholic prelates replied to this by requiring the reformers to return to the ancient church within a certain period. The princes who favored the new movement refused to comply with this demand, and in March of the following year they assembled at Schmalkald and formed the famous league, in terms of which they pledged themselves to uphold the Protestant cause. This decisive step soon attracted powerful support, largely because of its political importance, and among others who joined the Schmalkald League were Francis I of France and Henry VIII of England. After the death of Luther (1546) war broke out, but at the Peace of Augsburg (1555) the Reformation may be said to have finally triumphed, when each prince was permitted to adopt either the Reformed or the Roman Catholic faith, and Protestantism thus received legal recognition.

The doctrines of the German reformer found a willing adherent in Gustavus Vasa, who in 1523 became King of Sweden. Gustavus induced the estates of the realm, in the Diet of Westerås (1527), to sanction the confiscation of the monasteries, and declared himself supreme in matters ecclesiastical. The last remains of Catholic usages were abolished at a second Diet of Westerås in 1544. The first systematic measures in favor of the Reformation in Denmark were taken by Frederick I, instigated by his son Christian, who had studied in Germany and became an enthusiastic Lutheran. At a diet held in 1536, at which no member of the clergy was allowed to be present, the assembly decreed the abolition of the Roman Catholic worship in the Danish dominions. In Hungary, where numerous Germans had settled, bringing Lutheranism with them, the new faith for a short time made rapid progress, especially in the cities and among the nobles. In Poland the Reformation found numerous adherents also. In Italy and Spain, however, Protestantism was mostly confined to the higher and cultivated classes, the Reformed faith taking scarcely any hold on the people at large. In Naples, Venice, Florence, and other cities Protestant churches were opened; but Protestantism was extirpated in Italy by the vigorous

action of the Inquisition and the instrumentality of the *Index Expurgatorius*. In Spain a few Protestant churches were established, and many persons of mark adopted the views of the Reformers. But here also the Inquisition succeeded in arresting the spread of the religious revolution. In the Swiss states the progress of Protestantism was of much more importance. It found a leader in Ulrich Zwingli, a preacher at Zürich, who, by sermons, pamphlets, and public discussions, induced that city to abolish the old and inaugurate a new Reformed Church. In this course Zürich was followed by Bâle, Berne, and other cities. Ultimately this movement was merged in political dissensions between the Reformed and the Catholic cantons, and Zwingli himself fell in battle (1531). Between Luther and Zwingli there were differences of opinion, chiefly concerning the Lord's Supper, in which the former showed considerable acrimony towards his fellow-reformer. The *Institutes of Calvin* formulated the doctrines of a large body of the reformers, who also accepted his ordinances regarding church discipline. (See *Calvin.*) After many tedious contests Calvin's creed was virtually accepted in the Netherlands and elsewhere, and it was introduced into Scotland by Knox. In France the Reformation seemed at first to find powerful support. Margaret, Queen of Navarre, sister of King Francis I, and many of the higher ecclesiastics favored the reformed doctrine. The New Testament was translated into French, churches to the number of 2000 were established by 1558, and the Huguenots, as the Protestants were called, formed a large religious party in the state. Here also, however, the religious element was mixed with political and personal hatreds, and in the civil strifes before and after the Massacre of St. Bartholomew (1572) the religious movement declined. The abjuration of Protestantism by Henry IV (1593) was a blow to the Huguenots, and though they obtained toleration and certain privileges by the Edict of Nantes (which see) this was finally revoked in 1685.

The Reformation in England was only indirectly connected with the reform movement in Germany. Wickliffe and the Lollards, the revival of learning, the writings of More, Colet, and Erasmus, the martyrdom of Thomas Bilney, had all combined to render the doctrine and discipline of the church unpopular. This feeling was greatly increased when the writings of Luther and Tyndale's translation of the Bible found eager readers. Then the political element came in to favor the popular reform movement. Henry VIII, in his efforts to obtain a divorce from Catherine, found it advisable to repudiate the papal supremacy and declare himself by act of parliament (1534) the supreme head of the Church of England. To this the pope replied by threats of excommunication, which were not, however, immediately executed. Yet the breach with Rome was complete, so far, at least, as the king was concerned. Under the new laws of supremacy and treason several of the clergy suffered at Tyburn; Sir Thomas More and Fisher, bishop of Rochester, were beheaded at Tower Hill; and the lesser and greater monasteries were suppressed. At this time there were three important parties in the state. There was the party who still held the pope to be the supreme head of the church; the king's party, who rejected papal authority but retained the Catholic faith; and there was the reformed party, who rejected both the authority and doctrine of the Roman Catholic Church. The doctrines of the Church of Rome, however, were still the established religion, and in 1539 the *Statute of the Six Articles* compelled all men, under penalty of burning, to admit six points of the Roman doctrine, of which the chief was the doctrine of transubstantiation. Yet the king (1544) allowed some progress to be made in the direction of change by the publication of the *Litany* and some forms of prayer in English. This movement was continued and the Reformation effected in all essential points during the reign of Henry's successor, Edward VI. The penal laws against the Lollards were abolished; the *Statute of the Six Articles* ceased to be enforced; the Protestant ritual and teaching was adopted by the church; all images were removed from churches; a new communion service took the place of the mass; a *First Book of Common Prayer* was compiled by Cranmer and purged of distinctive Catholic doctrine; and in 1549 the First Act of Uniformity enjoined the use of this book in all the churches. Still further, in 1551, the newly established faith of the Reformers was summed up in the *Forty-two Articles of Religion*, which, in the reign of Elizabeth, became the *Thirty-nine Articles of the Church of England*. By these and other means the Reformation was established gradually throughout England.

In Scotland the movement was more directly connected with the Continent, and in particular with Geneva. The first indication of the struggle for reform

is found in the martyrdom (1528) of Patrick Hamilton; and this policy of suppression was continued (1539-46) with great severity by Cardinal Beaton, until he himself became the victim of popular vengeance. Perhaps the most important result of this persecution, and the martyrdom of George Wishart, which Beaton had brought about, was that it determined John Knox to embrace the new reformed faith. In 1540-47 this Scottish reformer established himself as preacher to the Protestant congregation which held the castle of St. Andrews. When the castle was captured by the French fleet Knox was made prisoner and treated as a galley-slave, but regained his liberty after about eighteen months' hardship, and settled in England. During the Marian persecutions he withdrew to the Continent and visited the churches of France and Switzerland, but returned to Scotland in 1559. Here he at once joined the Protestant party; preached in Dundee, Perth, and St. Andrews, amid public tumult and the destruction of images, altars, and churches; and finally, under the protection of the Lords of the Congregation, he established himself as a preacher of Protestantism in St. Giles', Edinburgh. From this center Knox traveled all over Scotland teaching the reformed faith; and such was the roused spirit of the people, that when the Scottish parliament assembled (1560) a popular petition was presented demanding the abolition of popery. This was promptly accomplished, and at the assembling of the new Church of Scotland shortly afterwards Knox presented his reformed system of government under the name of the First Book of Discipline, which was adopted by the Assembly. (See *Knox.*) The position thus secured by the reformer was maintained and the Reformation successfully established in Scotland. In Ireland for various causes the Reformation never made much progress, and Roman Catholicism remained the prevalent religion in that country, as it is to-day the established religious system in France, Spain and Italy.

Refor'matory Schools, schools instituted for the training of juvenile offenders who have been convicted of an offense punishable by imprisonment. The first reformatory managed under legislative control was the one established in New York in 1824, known as the New York House of Refuge. Its success was so marked that at present there are fifty-six institutions in the United States for the reformation of the juvenile offenders. The treatment is mostly educational, although in many institutions the inmates are employed in productive labor nearly one-half of the time. In some reformatories, in late years, attention has been given to industrial training, with marked success. Reformatories throughout the United States compare favorably with the best in other countries, and are rapidly progressing, much attention having been given of late years to this means of dealing with the criminally inclined young. See *Industrial Schools.*

Reformed Churches, those bodies which are in their standards and confessions markedly Calvinistic, and which usually adhere to the presbyterial as distinguished from the episcopal form of church government. In Germany the term is used to distinguish the churches which follow the doctrines of Calvin rather than those of Luther. There are in the United States four reformed churches: *The Reformed Church in the United States*—for many years known as the 'German Reformed Church'—traces its origin chiefly to the German, Swiss, and French people who settled in America early in the 18th century. In 1916 it had 1217 ministers and 320,660 communicants. Its coetus was organized in 1747, and its synod in 1792. Its symbol is the Heidelberg Catechism. The Second Reformed church in the United States in size is the Dutch Reformed Church, now known as the *Reformed Church in America*, which was organized in 1628 under the Dutch control of New York. In 1916 it had 774 ministers and 127,000 communicants. Its symbols are the Heidelberg Catechism, the Belgic Confessions and the canons of Dort. The *Christian Reformed Church* originated from the Reformed Church of Holland in 1835. There is also a *Hungarian Reformed Church.*

Reformed Episcopal Church, a religious body organized in New York City, December 2, 1873, under the leadership of Bishop George David Cummins, D.D., to perpetuate the old evangelical or low tendency in the Protestant Episcopal Church. In 1913 the church had 83 ministers and 10,800 communicants.

Reformed Presbyterians, or CAMERONIANS, a sect of Scottish Presbyterians, originating in the latter part of the 17th century. For upwards of sixteen years after they had publicly avowed their principles they remained in an unorganized condition and without a regular ministry. The first who exer

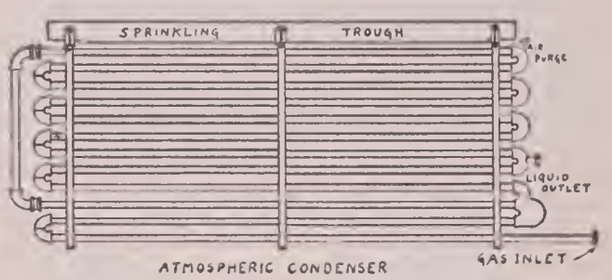
cised this office was the Rev. John McMillan, who in 1706 demitted his charge as parish minister of Balmaghie, and in 1743 he met with a coadjutor in the Rev. Thomas Nairne, whereupon these two constituted a Reformed Presbytery in 1743. In 1810 three presbyteries were formed, and in 1811 a synod was constituted. The number of presbyteries was afterwards increased to six, and the number of ministers rose to about forty. In 1876 a large portion of them united with the Free Church of Scotland. In 1743 the Reformed Presbyterians, or Covenanters, established a synod in the United States. In 1833 they divided on the question of service in the army and other matters, and two church bodies were formed: the Synod of the Reformed Presbyterian Church in North America, which has now about 8500 members; and the Reformed Presbyterian Church General Synod, with about 2500 members. The Associate Reformed Presbyterian Church was organized in South Carolina in 1803. It has 15,000 members.

Refraction (re-frak'shun), the deflection or change of direction impressed upon rays of light obliquely incident upon and passing through a smooth surface bounding two media not homogeneous, as air and water,—or upon rays traversing a medium, the destiny of which is not uniform, as the atmosphere. (See *Optics.*) A familiar instance of refraction is the broken appearance which a stick presents when thrust partly into clear water, the portion in the water apparently taking a different direction from the other portion. Glass, water, and other solids and fluids each have a different power of refraction, and this power in each case may be expressed numerically by a number known as the *index of refraction. Atmospheric refraction* is the apparent angular elevation of the heavenly bodies above their true places, caused by the refraction of the rays of light in their passage through the earth's atmosphere, so that in consequence of this refraction the heavenly bodies appear higher than they really are. It is greatest when the body is on the horizon, and diminishes all the way to the zenith, where it is nothing. *Double refraction* is the separation of a ray of light into two separate parts, by passing through certain transparent mediums, as Iceland-spar, one part being called the ordinary ray, the other the extraordinary ray. All crystals except those whose three axes are equal exhibit double refraction.

Refractor, or Refracting Telescope. See *Telescope.*

Refrigerant (rē-frij'er-ant), a cooling medicine, which directly diminishes the force of the circulation, and reduces bodily heat without any diminution of nervous energy. The agents usually regarded as refrigerants are weak vegetable acids, or very greatly diluted mineral acids; effervescing drinks, saline purgatives, etc. Refrigerants in medicine and surgery are also applied externally in the form of freezing-mixtures prepared with salt and pounded ice for the purpose of lowering the temperature of any particular part of the body.

Refrigeration (re-frij'ėr-ā'shun; Lat. *refrigerare*, to cool again), the art of producing cold by the melting of ice or the reaction of certain chemical compounds which absorb heat by mechanical means. Refrigeration is produced by using to advantage a well known law of physics, namely, that all substances absorb heat when passing from a liquid to a gaseous state and give



out the same amount of heat when returning to a liquid state. Of course, only those liquids are capable of being used as refrigerating agents whose vapors can be liquefied under pressure at ordinary temperatures. Most important of these are ether, methyl chloride, sulphurous acid, carbonic acid and ammonia. Ammonia is the best for all practical purposes and most frequently used except for refrigeration on board ship. In this case a refrigerant must be chosen which is not deleterious to persons or property and also with an eye to economy of space Carbonic acid is best fitted to fulfill the above conditions and for this class of work is found most advantageous.

The number and variety of refrigerating machines available for these purposes is very great, but that most universally used is the compression type. The first compression refrigerator machine was invented by Jacob Perkins in 1834. Subsequent improvements have been made but the most marked and rapid development has occurred in recent years, due to the fact that the available supply of natural ice is far inadequate to meet the extensive demands of our growing civilization.

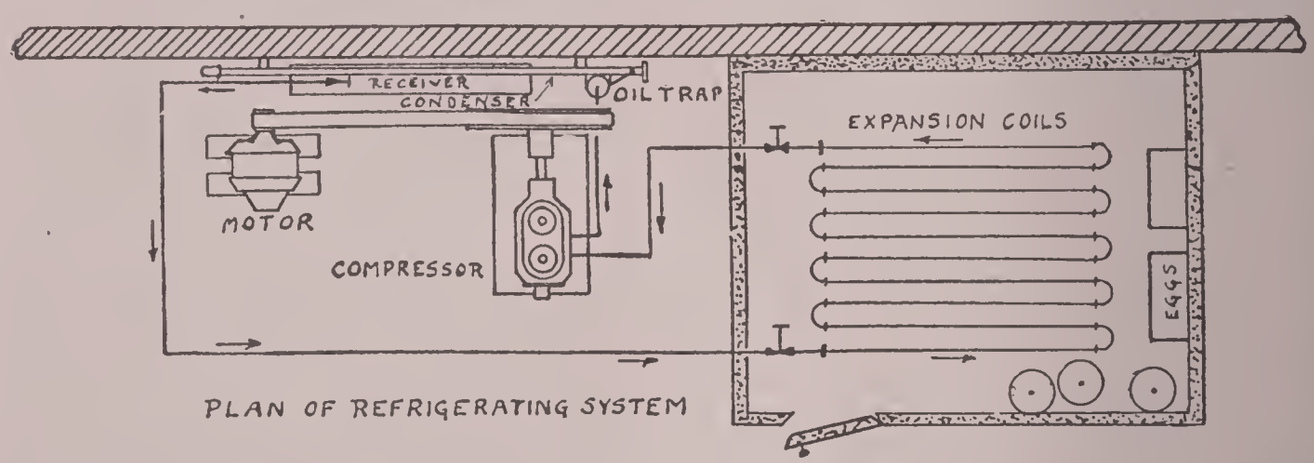
The action of ammonia in the compression type of refrigerating system is as follows: Ammonia is, in its natural state, a vapor. However, for commercial

purposes it is liquefied under pressure and sold to the user as liquid anhydrous ammonia, in steel cylinders. When allowed to escape from this confining container into the refrigerating system, it first enters the receiver or ammonia reservoir. From here it flows to the expansion valve, through a small pipe line where it is suddenly released from pressure and immediately expands to its normal state as a vapor. This action takes place in the expansion coils in the refrigerator and is accompanied by the absorption of heat from the air or substance with which the cold pipes come in contact. These coils are larger in diameter than the liquid line, being constructed generally of 1", 1¼" or 2" pipe. The spent ammonia gas is sucked back to the compressor, the propelling member of the system. From the compressor, which is generally of the piston type, the ammonia is pumped under pressure to the condenser. Before entering this, however, the gas passes through an oil trap, a small upright cylinder in which is precipitated any oil, scale or dirt which may have been picked up throughout the system. In the condenser the ammonia vapor is liquefied under pressure. Condensers are of two types, double pipe and atmospheric. In the double pipe style the inner pipe is filled with circulating, cold water, the ammonia vapor entirely surrounding it in the annular space between the two pipes. In the atmospheric condenser, a single pipe coil, the water splashes over the outside of the pipe and the ammonia circulates within. In either case the water absorbs the heat thrown off by the ammonia through liquefaction. It can thus be seen that the heat from the refrigerator and articles stored therein is really carried off by the water and ammonia is only an agent in this process. From the condenser the liquid drops into the receiver, completing the cycle of operation The ammonia may be used repeatedly, with only slight replenishing, because of leakage which it is impossible to entirely prevent.

The above description is typical of the operation in an average plant, operated on the direct expansion system. The number and size of refrigerators, of course, may vary according to the duty required, but each can be independently operated by the use of valves in the ammonia lines.

A system of refrigeration is also used in which air is first cooled to the desired temperature and circulated by fans. Another type much in vogue in large hotels and institutions where the boxes are spread throughout the building, is the brine system. In this case a non-congealable solution of calcium chloride is cooled in a double coil, similar to the double pipe condenser. The brine is here circulated through the inner pipe and then pumped to the various refrigerators.

Artificial Ice. For the manufacture of artificial ice the compression machine



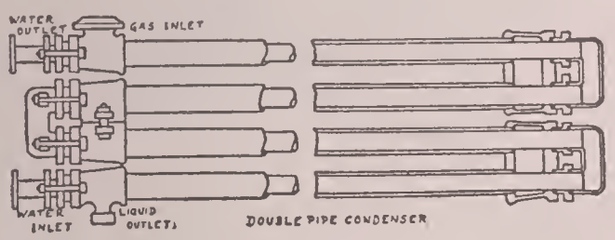
PLAN OF REFRIGERATING SYSTEM

has also been found most suitable. The compression ice plant recommends itself because of its simplicity; its freedom from complicated chemical actions, its operation being based on ordinary mechanical principles, well known to every competent engineer; its accessibility for examination and repairs; and its general reliability.

Ice plants may be divided into two general classes: (1) That in which the surface upon which the ice is frozen is fixed, such as Plate, Block, Arctic, Jewell, etc.; (2) That in which the surface upon which the ice is frozen, is removable for harvesting purposes, as in any system where cans are used. The call in the trade for plants which come under the first classification has not been sufficiently large to justify the expenditure of any great amount of time by the engineers engaged in the industry, except in isolated cases or special installations. Greater development has, therefore, taken place in the can system. In this the ac-

tion of the ammonia is identical with that described for cold storage plants, except that the expansion coils are submerged in a solution of calcium chloride or sodium chloride, in a steel tank. These chemicals are added to lower the freezing point. Immersed in the brine between the coils are the ice cans.

Distilled water when frozen produces clear ice. The decrease in use of steam as a motive power, however, caused the increase in manufacture from raw water, which produces opaque ice of inferior quality because of the entrapped air and impurities being frozen in the ice. To overcome this, the air-agitating system was developed, in which tubes are placed inside the ice cans and forced-air agitation drives the air out of the water and collects the impurities which may be sucked out before freezing into the ice. The can of water entirely surrounded by brine at a temperature from about 10° to 20° F. is frozen and can be hoisted from the tank and the ice removed from the can, after being melted slightly around



the edges by the application of warm water. The can is then refilled and replaced in the ice tank. About fifty hours is necessary to freeze a standard 300-lb. cake under normal conditions, which, however, may vary considerably, due to the operation of the plant.

Refrigerators and ice tanks should be insulated to prevent the escape of cold and the entrance of heat. For this purpose cork is found most suitable, because of being the best non-conductor of heat known and being free from liability to injury through moisture. Much condensation naturally takes place upon chilling the air and settles on walls or on the coils in the form of ice and frost. Exposed brine lines and ammonia suction lines should also be insulated to prevent loss of refrigeration.

Successful experiments have been made with electric refrigerators for household use, in which the manufacturers have substituted sulphur dioxide, which requires a relatively low condensing pressure, for ammonia or carbon dioxide.

Refuge (ref'ūj), CITIES OF. See *Cities of Refuge.*

Refugee (ref-ū-jē'), a person who seeks safety in a foreign country to escape persecution for religious or political opinions. A large historical movement of this kind occurred when the Edict of Nantes was repealed in France (1685). Such were the oppressions then put upon the Protestants by Louis XIV, aided by the extremists in the Catholic party, that thousands of Huguenots, who refused to profess Catholicism, fled from the country. Four thousand escaped to Geneva. Holland received countless fugitives. Even in England the Catholic King James II had to permit large collections of money to be made for the refugees. Sixteen thousand Huguenots found welcome in Brandenburg, and others in the Hohenzollern principalities in Franconia, Ansbach and Bayreuth. The same reception awaited them in other Protestant states. The loss to France was immeasurable. It was precisely the elite of the French Protestants—the men who through culture, property, abilities and character — who were able to make their way into foreign lands. The refugees brought to their new homes their intelligence, their energy, their industrial capacity, a part of their wealth, and their stern hatred for Louis XIV. It should be said that the persecution had its origin in no true feeling for the church, but in the domineering, intolerant spirit of Louis XIV, who held it unthinkable that nearly 2,000,000 of his subjects should presume to believe otherwise than the king, and should hold his religion to be false.

Refunding (re-fund'ing; from Latin *re*, 'back,' and *fundo*, 'to pour'), the act of funding anew, or replacing by a new-funded loan, as a government may re-write the terms of a loan to another government, extending the time limit or altering the rate of interest. To 'fund' is to convert into a permanent loan or into bonds payable with interest. See *Funds, Public,* and *National Debt.*

Regal (rē'gal), a small portable organ played with the fingers of the right hand, the left being used in working the bellows. It was much used during the sixteenth and seventeenth centuries.

Regalia (re-gā'li-a), the emblems or insignia of royalty. The regalia of England consist of the crown, scepter with the cross, the verge or rod with the dove, the so-called staff of Edward the Confessor, several swords, the ampulla for the sacred oil, the spurs of chivalry, and several other articles. These are preserved in the jewel-room in the Tower of London. The regalia of Scotland consist of the crown, the scepter, and the sword of state. They, with

several other regal decorations, are exhibited within the crown-room in the

Regal, from an old painting.

castle of Edinburgh. The term is also improperly applied to the insignia, decorations, etc., of orders, secret societies, etc., and similar institutions.

Regatta (re-gat'a), originally a gondola race held annually with great pomp at Venice, and now applied to any important showy sailing or rowing race, in which a number of yachts or boats contend for prizes.

Regelation (rē-jel-ā'shun), refreezing, a name given to the phenomena presented by two pieces of melting ice when brought into contact at a temperature above the freezing point. In such a case congelation and cohesion take place. Not only does this occur in air, but also in water at such a temperature as 100° Fahr. The phenomenon, first observed by Faraday, is of importance in the theory of glacier movements. See *Glaciers*.

Regeneration (re-jen-er-ā'shun), in theology, is the equivalent used by the English translators of the Bible for the Greek word *palingenesia*, which occurs only twice in the New Testament, in Matt. xix, 28 and in Titus iii, 5. In the former passage the term is applied generally to the gospel dispensation as a process of renovation; in the latter it is used as descriptive of the process of individual salvation. An equivalent term is used in 1 Peter i, 3, where it is translated 'begotten us again;' and in one or two other passages regeneration, as a theological term, refers to the doctrine of a change effected upon men by divine grace, in order to fit them for being partakers of the divine favor, and for being admitted into the kingdom of heaven.

Regent (rē'jent), a person who governs a kingdom during the minority, absence, or disability of the king or queen. In most hereditary governments the maxim is, that this office belongs to the nearest relative of the sovereign capable of undertaking it; but this rule is subject to many limitations.— In the English universities the name is given to members with peculiar duties of instruction or government. In the United States there are regents of various educational, benevolent and public institutions.

Regent-bird, or KING HONEY-EATER (*Sericŭlus chrysocephălus*), a very beautiful bird of Australia, belonging to the family Meliphagidæ or honey-eaters. The color of the plumage is golden yellow and deep velvety black. It was discovered during

Regent-bird *Sericŭlus chrysocephălus*).

the regency of George IV, and was named in compliment to him.

Reggio di Calabria (red'jō), (ancient. *Rhegium Julii*), a seaport of South Italy, capital of a province of the same name, on the east coast of the Strait of Messina, a handsome and beautifully-situated town. The principal edifice is the cathedral, a spacious basilica. The seat of an archbishop, and with manufactures of silk, linen, pottery, perfume, etc., it was destroyed by a violent earthquake in December, 1908, together with many smaller places in the province, and the city of Messina, in Sicily. The greater part of its population of about 45,000 perished.

Reggio nell' Emilia (*Rhegium Lepidi*), a town of North Italy, capital of the province of the same name, 15 miles W. N. W. of Modena. It is surrounded by walls and ramparts, has regular streets, is the seat of a bishop, has an ancient cathedral with a lofty dome, and several other churches, a handsome town-house, museum, library, theater; manufactures of linen and silk goods, and a trade in cattle and wine. Pop. 70,419.—The

province of Reggio lies between those of Parma on the west and Modena on the east; area, 877 square miles.

Regillus (rē-jil'us), anciently a small lake of Italy, in Latium, to the southeast of Rome (site uncertain), celebrated for a great battle between the Romans and Latins in B.C. 496.

Regiment (rej'i-ment), a body of regular soldiers forming an administrative division of an army, and consisting of one or more battalions of infantry or of several squadrons of cavalry, commanded by a colonel and other officers. A regiment is the largest permanent association of soldiers, and the third subdivision of an army corps, several regiments going to a brigade, and several brigades to a division. These combinations are temporary, while in the regiments the same officers serve continually, and in command of the same body of men. The strength of a regiment may vary greatly, as each may comprise any number of battalions. In the United States army an artillery regiment consists of twelve batteries, and has 595 enlisted men; a cavalry regiment comprises twelve troops each numbering seventy-eight privates; an infantry regiment contains ten companies, the number of privates varying from fifty to one hundred men in each company. In Britain, under the new army organization, the country is divided into regimental districts.

Regina (rē-jī'na), capital of the Province of Saskatchewan, in the Canadian Northwest, a rising town on the Canadian Pacific Railway, situated near the fertile wheat district of the Qu'appelle Valley. Pop. (1911) 30,213.

Regiomontanus (rā-ji-o-mon-ta'-nus), a German astronomer, whose real name was Johann Müller, was born at Königsberg (in Latin *Regiomontum*), in Franconia, in 1436; died in 1475. He was educated at Leipzig; studied mathematics at Vienna; accompanied Cardinal Bessarion to Rome, where Beza gave him further instructions in Greek literature, which enabled him to complete a new abridgment in Latin of the *Almagest of Ptolemy* (Venice, 1496). In 1471 he built an observatory at Nürnburg, but he returned to Rome on the invitation of Sixtus IV, who employed him in the reformation of the calendar.

Register (re'jis-tėr), a device for automatically indicating the number of revolutions made or amount of work done by machinery; or recording steam, air, or water pressure, or other data, by means of apparatus deriving motion from the object whose force, distance, velocity, direction, elevation, or numerical amount it is desired to ascertain. In music, the compass of a voice or instrument, or a portion of the compass of a voice; as the upper, middle, or lower register. Also, an organ stop, or the knob or handle by means of which the performer commands any given stop.—CASH REGISTER, an apparatus now widely in use in stores for registering the amount of cash received for sales.

Registration of Births, Deaths and Marriages. Parish registers of baptisms, marriages, and burials were instituted by Lord Cromwell while he was vicar-general to Henry VIII, and subsequently regulated by various acts of parliament. No thorough system, however, existed until in 1836 a Registration Act was passed applicable to England and Wales, which has been amended by subsequent acts. Somewhat similar systems exist in Scotland and Ireland. In the United States the record of deaths has always been tolerably accurate. The officiating minister, priest, or magistrate at a wedding, and the physician or midwife at a birth, are required, under penalty for failure to do so, to report to the proper office the name, age, sex, nativity, color, and social condition of the persons who marry, and the sex and color of children born, with nativity of the parents. As registration is not within the scope of federal legislation, much depends upon the co-operation of the States and cities.

Registration of Electors. In the United States there is no general law requiring the registration of voters; but 34 States have registration laws, without compliance with which no man can vote. Partial registration, as in cities, or cities and villages is required in several other States.

Registration of Titles. See *Torrens System.*

Regius Professors (rē'ji-us), is the name given to those professors in the English universities whose chairs were founded by Henry VIII. In the Scotch universities, the same name is given to those professors whose professorships were founded by the crown.

Regnault (rė-nō), HENRI VICTOR, a French chemist and physicist, born in 1810; died in 1878.

He was educated at the École Polytechnique, Paris; became professor at this institution in 1840, and professor of physics at the Collége de France the following year; chief engineer of mines in 1841; and director of the porcelain manufacture at Sèvres in 1854. He published *Cours Elémentaire de Chimie*, and *Premiers Eléments de Chimie*, both popular works.

Regulus (reg'ū-lus), a name originally applied by the alchemists to antimony. The term is now used in a generic sense for metals in different stages of purity, but which still retain to a greater or less extent the impurities they contained in the state of ore.

Reg'ulus, MARCUS ATTILIUS, a Roman general, who was made consul a second time in 256 B.C., and was engaged in a war with Carthage, in which he destroyed their fleet and landed his army in Africa. In the following year, however, he was defeated and taken prisoner by the Carthaginians. Sent to Rome on parole by his captors to negotiate peace, Regulus patriotically persuaded his countrymen to continue the war and returned to captivity, where he died under torture.

Reichenbach (rī'*h*en-bâ*h*), a town of Prussia, province of Silesia, 30 miles southwest of Breslau, on the Peile. It has woolen and cotton manufactures. Pop. (1910) 16,581.

Reichenbach, a town of Saxony, in the circle and 7 miles southeast of Zwickau. It has manufactures of woolen and cotton goods; worsted and cotton mills; dye-works and bleachfields; machine works, foundries, etc., and a large trade. Pop. (1910) 29,685.

Reichenbach, CHARLES, BARON VON, a German scientist, born at Stuttgart in 1788; died in 1869. He studied law and natural science at Tübingen; established extensive works in Moravia, at which machinery, castings (statues, etc.), wood vinegar, tar, etc., were produced; published a monograph on geology; and gave his attention to animal magnetism, in connection with which he believed he had discovered a new force called *od*, regarding which he published various works. This supposed discovery is no longer credited. He is credited with some chemical discoveries, in particular of paraffin and creasote.

Reichenberg (rī'*h*en-ber*h*), a town of Bohemia, on the Neisse, 56 miles N. N. E. of Prague. It is the center of the woolen manufacture of Northern Bohemia, in connection with which industry there are a great number of establishments in the town and neighborhood. Pop. (1910) 36,350.

Reichenhall (rī'*h*en-hål), a town of Bavaria, 65 miles southeast of Munich, situated in the midst of romantic scenery, on the Saal. It has one of the most important salt-works in the kingdom, the salt being obtained from brine springs. The brine is also used for bathing purposes. Pop. 4927.

Reichstag (rī*h*s'tå*h*; German *rcich*, a kingdom, and *tag*, a day, a diet), the imperial parliament of Germany, which assembles at Berlin. See *Bundesrath, Germany.*

Reid (rēd), MAYNE, juvenile writer, born in the north of Ireland in 1818; died in 1883. His love of adventure took him to America, where he traveled extensively as hunter or trader; joined the United States army in 1845 and fought in the Mexican war. He afterwards returned to London, where he became well known as a writer of thrilling juvenile stories, many of them based on his American experiences, such as the *Rifle Rangers*, *Scalp Hunters*, *The War Trail*, *The Headless Horseman*, etc.

Reid, THOMAS, a Scottish philosopher, born in 1710 at Strachan, Kincardineshire. He was educated at Marischal College, Aberdeen, and in 1737 was presented to the living of New Machar in Aberdeenshire. His first philosophical work was an *Essay on Quantity* (1748), in which he replied to Hutcheson, who had maintained that mathematical terms can be applied to measure moral qualities. In 1752 the professors of King's College, Aberdeen, elected Reid professor of moral philosophy in that college; and in 1764 he published his well-known work, *An Inquiry into the Human Mind on the Principles of Common Sense.* The same year he succeeded Adam Smith as professor of moral philosophy in Glasgow University, a position which he occupied until 1781. His other writings are, *Essays on the Intellectual Powers of Man* and *Essays on the Active Powers of the Human Mind.* His philosophy was directed against the principles and inferences of Berkeley and Hume, to which he opposed the doctrine of Common Sense (which see). He was the earliest expounder of what is known as the Scottish School of Philosophy, in which he was followed by Dugald Stewart and Sir William Hamilton.

His doctrines were adopted also by several eminent French philosophers. He died in October, 1796.

Reid, WHITELAW (1837-1912), an American editor and ambassador, born at Xenia, Ohio, graduated from Miami University in 1856. After editorial work on several Ohio papers he joined the editorial staff of the New York *Tribune*, becoming editor and proprietor in 1872. He was Minister to France 1889-92; Republican candidate for Vice-President in 1892; Special Ambassador to Great Britain for Queen's Jubilee, 1897; and for Coronation of Edward VII, 1902; Ambassador to Great Britain from 1905. He died in London, December 15, 1912.

Reidsville, a city of Rockingham Co., North Carolina, 70 miles N. W. of Raleigh. It has tobacco and cotton interests. Pop. (1920) 5333.

Reigate (rī'gāt), a town of Surrey, England, 23 miles S. of London. Pop. 28,505.

Reign of Terror, a period of the French Revolution, conspicuous for its horrors and cruelties, under the leadership of Robespierre and Marat. It is generally considered to extend from January 21, 1793, the date of the execution of Louis XIV, to July 28, 1794, when Roespierre and other sanguinary leaders were guillotined on the spot where their victims had been killed.

Reindeer (rān'dēr), a species of deer found in the northern parts of Europe and Asia, the *Cervus tarandus* or *Tarandus rangifer*. It has

Reindeer (*Cervus tarandus*)

branched, recurved, round antlers, the summits of which are palmated; the antlers of the male are much larger than those of the female. These antlers, which are annually shed and renewed by both sexes, are remarkable for the size of the branch which comes off near the base, called the brow antler. The body is of a thick and square form, and the legs shorter in proportion than those of the red-deer. Their size varies much according to the climate, those in the higher Arctic regions being the largest; about 4 feet 6 inches may be given as the average height of a full-grown specimen. The reindeer is keen of sight, swift of foot, being capable of maintaining a speed of 9 or 10 miles an hour for a long time, and can easily draw a weight of 200 lbs., besides the sledge to which they are usually attached when used as beasts of draught. Among the Laplanders the reindeer is a substitute for the horse, the cow, and the sheep, as he furnishes food, clothing, and the means of conveyance. The reindeer has, of late years, been introduced into Alaska and Labrador, and promises to be of great utility to the natives.

Reindeer Moss, a lichen (*Cenomyce rangiferina*) which constitutes almost the sole winter food for reindeer, etc., in high northern latitudes, where it sometimes attains the height of 1 foot. Its taste is slightly pungent and acrid, and when boiled it forms a jelly possessing nutritive and tonic properties.

Reineke Fuchs (rī'nek-ė fu̱ks). See *Renard*.

Reinforced Concrete. See *Concrete*.

Relapsing Fever (rė-lapz'ing), a fever so-called from the fact that during the period of convalescence a relapse of all the symptoms occurs, and this may be repeated more than once. It is usually regarded as an epidemic and contagious disease.

Relativity (rel-a-tiv'i-ti), the state or quality of being connected with, or of having reference to, something else. The *Theory of Relativity*, developed by Professor Edwin Einstein, the German scientist, is a radical departure from commonly held ideas with regard to time and space. Briefly he discards absolute time and space and makes them in every instance relative to moving systems, insisting that if there were no sun, no earth and other celestial bodies, time and space could not exist at all. Every object, therefore, must be regarded as existing in four dimensions, three of these being the ordinary ones of length, breadth and thickness, and the fourth, time. The term 'space' is applicable only by analogy to

such a region; it has been called a 'continuum,' and the analogue of a point in ordinary three-dimensional space has been appropriately called an 'event.' By 'dimension' is understood merely one of four independent quantities which locate an event in this continuum. (Consult L. Bolton's *Introduction to the Theory of Relativity*, E. Cunningham's *Relativity*, and the *Scientific American* prize essay, in issue of Feb. 5, 1921.)

The old principle of the relativity of motion is that uniform motion must be relative. When traveling by trains or boats we cannot tell whether we are at rest or moving uniformly unless we look out upon some external body; and when we look at a third body of reference, when we look we cannot tell whether our system or the other one is moving unless we look at a third body of reference, like the ground or the water. We therefore say that uniform motion must be relative.

Until Einstein developed his general relativity theory it was also believed that absolute motion was possible. To illustrate, consider the propagation of light, heat, and the wireless waves. These forms of energy have definite speeds in space and have the characteristics of waves. But if they are waves there must be a medium to carry them, and this medium, called the ether, was taken as a convenient standard for the concept of absolute motion. Michelson, the American physicist, devised a test for the existence of the ether. He argued that if there be an ether, then as the earth moves through it there should be relative motion between the ether and an observer on the earth. If we measure the speed of light in the direction of the earth's motion and also at right angles to that direction, we should get two different values, just as an observer trying to measure the velocity of sound in air would get a different result if he took one measurement across the direction in which a wind was blowing, and another in the same direction as that of the wind. When the actual test was made no trace of an ether breeze was found. Moreover, other very careful tests devised to discover motion relative to the ether have all given negative results.

This led Einstein to the first postulate of his special relativity theory, namely: Observations confined to a system in uniform motion can never tell us whether the system is at rest or in motion.

Another consequence of Michelson's experiment, insisted upon by Einstein, is: Light in space has the same velocity relative to all observers, regardless of their state of rest or of motion.

These two postulates enabled Einstein to formulate a set of equations which would make it possible for two observers located in different moving systems to arrive at identical expressions for the laws of the universe. These equations constitute the special relativity theory of Einstein, and they tell us that the concepts of length and time do not represent intrinsic properties of points or events but merely represent relations between these and the observer. These relations are subject to change with the observer's velocity. Moreover, time and space can no longer be considered entirely independent of one another. An observer in a moving system cannot tell where he is until he knows what time it is; and conversely he cannot tell what time it is until he knows where he is. This interdependence of time and space gives rise to the conception of the universe as a four-dimensional manifold. This merely means that it takes four measurements to specify an event, three of which give its location for any given time.

The special relativity theory being limited to uniformly moving systems is unsatisfactory, because, after all, the objective universe is the same, however fast we are moving and whatever way we are facing. It was therefore necessary to generalize it, if possible, in such a way that the new transformation equations would enable two observers located in different systems moving with any kind of relative motion to express the laws of the universe in identical fashion. The extension of the principle of relativity to its general form proved extremely difficult. It necessitated the abandonment of Euclidean geometry. The mathematics of Einstein's investigation is that part of his work which, we are told, but twelve men can follow.

Two predictions from Einstein's Law of Gravitation, as deduced from the general relativity principle, have been verified: One is that a beam of light, in a gravitational field, travels in a curved path rather than in a straight line; the other is the prediction of the irregularity in the motion of the planet Mercury. Einstein made his prediction regarding the curving of the light rays in 1914. The eclipse of May 29, 1919, was observed under most favorable conditions, and Einstein's theory was proven: the star rays were drawn in toward the sun in a mighty curve.

Release (rē-lēs'), in law, signifies, in general a person's giving up or discharging the right or action he has or claims to have against another or against his lands.

Relics (rel'iks), remains of saints and martyrs or objects connected with them, and especially memorials of the life and passion of our Lord, to which worship or a special veneration is sanctioned and practiced both in the Roman Catholic and Greek Churches. The doctrine of the Roman Catholic Church in regard to relics was fixed by the Council of Trent, which decreed in 1563 that veneration should be paid to relics as instruments through which God bestows benefits on men; a doctrine which has been rejected by all Protestant churches. The veneration of relics is not peculiar to Christianity, but has found a place in nearly every form of religion. Buddhism is remarkable for the extent to which relic-worship has been carried in it. The origin of relic worship or veneration in the Christian church is generally associated with the reverence paid by the early Christians to the tombs of the martyrs and to objects associated with their memory. Roman Catholics believe that relics are sometimes made by God instruments of healing and other miracles, and that they are capable of bestowing spiritual graces. The Council of Trent required bishops to decide on their authenticity. In course of time great abuses grew up in regard to relics; and it is scarcely necessary to add that the articles venerated as relics multiplied beyond measure. Not only did those of which the supply was necessarily limited, as the wood of the true cross and the relics of apostles and early martyrs, become common and accessible to an astonishing degree, but the most puerile and even ridiculous objects were presented as fitting symbols for veneration from their association with some saint or martyr, and were credited with the most astounding miracles. Such abuses have been greatly modified since the Reformation.

Relief (re-lēf'), in sculpture and architecture, is the projection of a figure above or beyond the surface upon which it is formed. According to the degree of projection a figure is described as in *high*, *middle*, or *low relief*. High relief (*alto-rilievo*) is that in which the figures project at least one-half of their apparent circumference from the surface upon which they are formed; low relief (*basso-rilievo*) consists of figures raised but not detached from a flat surface; while middle relief (*mezzo-rilievo*) lies between these two forms See *Bas-relief*, *Alto-rilievo*.

Religion (re-lij'un), the feeling of reverence which men entertain towards a Supreme Being or to any order of beings conceived by them as demanding reverence from the possession of superhuman control over the destiny of man or the powers of nature; more especially the recognition of God as an object of worship, love, and obedience. Religion denotes the influences and motives to human duty which are found in the character and will of the deity, while morality, in its ordinary sense, is concerned with man's duty to his fellows. As distinguished from *theology*, religion is subjective, inasmuch as it relates to the feelings; while theology is objective, as it denotes the system of beliefs, ideas, or conceptions which man entertains respecting the God whom he worships. Religion in one sense of the word, according to Max Müller, is a mental faculty by means of which man is enabled to apprehend the Infinite under different names and under varying disguises, and this independent of, or even in spite of, sense and reason; being also a faculty which distinguishes man from the brutes. Another, and a very common use of the term, applies it to a body of doctrines handed down by tradition, or in canonical books, and accompanied by a certain outward system of observances or acts of worship. In this sense we speak of the Jewish, the Christian, the Hindu, etc., religions. Religions in this sense are divided into two great classes, polytheistic and monotheistic; that is, those recognizing a plurality of deities and those that recognize but one. (See *Polytheism*, *Monotheism*.) A dualistic class may also be established, in which two chief deities are recognized, and a *henotheistic*, in which there are one chief and a number of minor deities. In some religions magic, fetishism, animal worship, belief in ghosts and demons, etc., play an important part. The most remarkable religious conquests in history are that of Judaism, which effected the establishment of a national religion, originally that of a single family, in a hostile territory by force of arms and expulsion or extinction of the previous inhabitants; that of Christianity, which, by the power of persuasion and in the midst of persecution, overthrew the polytheism of the most enlightened nations of antiquity; that of Mohammedanism, which, partly by persuasion, but more by force, established itself on the site of the eastern empire of Christianity, and extended its sway over a population partly idolatrous and partly Christian; and that of Buddhism, which, being expelled by persecution or otherwise from India, where it had widely disseminated itself by conversion, spread itself by

moral suasion over the larger portion of Eastern Asia. All these religions, with the exception of Buddhism, which may perhaps be considered atheistic, are monotheistic systems.

Various estimates have been made of the diffusion of the various religious creeds over the world. These are necessarily very loose and often differ widely from each other. A recent estimate is the following: —

Confucianists and Taoists	310,925,000
Roman Catholics	288,000,000
Mohammedans	227,040,000
Hindus	215,512,000
Protestants	167,000,000
Animists	161,272,000
Buddhists	140,047,000
Eastern Catholics	121,000,000
Shintoists	25,015,000
Jews	14,972,000

Religion, ESTABLISHED, the form of religion recognized as national in a country. See *Established Church.*

Religious Liberty, or LIBERTY OF CONSCIENCE, is the recognition and assertion by the state of the right of every man, in the profession of opinion and in the outward forms and requirements of religion, to do or abstain from doing whatever his individual conscience or sense of right suggests. Religious liberty is opposed to the imposition by the state of any arbitrary restrictions upon forms of worship or the propagation of religious opinions, or to the enacting of any binding forms of worship or belief. The limit of religious liberty is necessarily the right of the state to maintain order, prevent excesses, and guard against encroachments upon private right. In the organization of civil and ecclesiastical government which prevailed from Constantine to the Reformation persecution extended to all dissenters from the established creed, and universal submission to the dominant church became the condition of religious peace throughout Christendom, religious liberty being unknown. The contest of opinion begun at the Reformation had the effect of establishing religious liberty, as far as it at present exists, but the principle itself was so far from being understood and accepted in its purity by either party that it hardly suggested itself even to the most enlightened reasoners of that age. In Great Britain even, civil liberty, jealously maintained, was not understood, by the dominant party at least, to impart religious liberty. Active measures of intolerance were adopted against Dissenters in the reign of Queen Anne. Even in the reign of George III conditions were attached to the toleration of Dissenting preachers; and civil enactments against Roman Catholics have been repealed only within the nineteenth century. Religious liberty was introduced in Prussia by Frederick the Great, but contravened by his immediate successor. The state at present in Prussia, without, perhaps, actually dictating to private individuals, maintains a vigilant control over ecclesiastical organization, the education of the clergy, and all public matters connected with religion. Religious liberty has only been established in Austria by statutes of 1867-68. Italy first enjoyed the same advantage under Victor Emmanuel II. The government of France, ever since the revolution, has always been of a paternal character, and practically religious liberty is limited there. In Spain, at one time the most despotic state in Europe, restricted liberty of worship was allowed in 1876. Religious persecution was actively conducted against the Roman Catholics in Russia during the reign of the emperor Nicholas, and full religious liberty does not yet exist. Since the Crimean war religious liberty has been recognized in Turkey. Toleration has thus been slowly advancing in Europe since the Reformation, and its recent progress has been extensive; yet even in the most advanced countries the state of public opinion on this subject is still far from being satisfactory. In the United States religious liberty has always been recognized, and in this sense it is the freest nation on the earth.

Reliquary (rel-i-kwar'i). a box or casket in which relics are kept. See *Relics.*

Remainder (re-mān'dėr). in law, is a limited estate or tenure in lands, tenements, or rents, to be enjoyed after the expiration of another particular estate.

Rembang (rem-bäng'), a town of Java, in the province of same name, 60 miles W. N. W. of Samarang. Its harbor is one of the best in the island; it has a good trade in ship-timber and in ship-building, and near it are valuable salt-pans. Pop. 14,000.

Rembrandt (rem'brant), in full REMBRANDT HERMANSZ VAN RYN, the most celebrated painter and etcher of the Dutch school, was born June 15, 1606, at Leyden, where his father was a well-to-do miller. Early displaying a passionate love for art, he received instructions from Van Swanen-

"THE WINDMILL," BY REMBRANDT

This famous painting was sold by Lord Lansdowne to the late P. A. B. Widener, of Philadelphia, for a reputed price of $500,000. It is one of the most noted of Rembrandt's landscapes.

burch of Leyden, a painter of little note, and afterwards studied in Amsterdam under Pieter Lastman. But he soon returned home, and pursued his labors there, taking nature as his sole guide, and confining himself to delineations of common life. In 1630 he removed to Amsterdam, which he never left again. In 1634 he married Saskia van Uilenburg, daughter of the burgomaster of Leeuwarden. Rembrandt has rendered her famous through numerous etched and painted portraits. She died in 1642. Rembrandt became the master of numerous pupils, Gerard Douw, being among the number. His paintings and etchings were soon in extraordinary demand, and he must have acquired a large income by his work, but his expenditure seems to have been greater; and in 1656 he was declared bankrupt, his property remaining in the hands of trustees till his death. This took place at Amsterdam in 1669. He had married a second time, but the second wife's name is not known. Rembrandt excelled in every branch of painting, and his treatment of light and shade has never been surpassed. His works display profound knowledge of human nature, pathos, tragic power, humor, and poetic feeling. His eminence in portraiture may especially be noted in portrait-groups in particular. His artistic development may be broadly divided into three periods. To the first of these (1627-39), which shows less mastery than the succeeding two, belong his *St. Paul, Samson in Prison, Simeon in the Temple, Lesson in Anatomy* (Tulp, the anatomist), and various character portraits of his life as *Queen Artemisia, Bathsheba, The Wife of Samson*, etc. To his middle period (1640-54) belong *The Night Watch, The Woman Taken in Adultery, Tobit and His Wife, The Burgomaster and His Wife, Descent from the Cross, Portrait of Coppenol, Bathsheba*, and *Woman Bathing*. Among the works of his last period (1655-68) may be mentioned *John the Baptist Preaching, Portrait of Jan Six, The Adoration of the Magi, The Syndics of Amsterdam*, and various portraits of himself. His etchings in technique and deep suggestion have not yet been equaled. He was the first and as yet the greatest master of this department of art. Some of them have been sold at large prices — *Jesus Healing the Sick*, known as the Hundred-guelder Piece (1st state), having been sold at the Buccleuch sale in 1887 for 1300 guineas; and two others, a Coppenol and *Jesus Before Pilate*, bringing 1190 and 1150 guineas respectively. Their present values are much greater.

Remensnyder (rem'en-snī'dėr), JUNIUS BENJAMIN, an American Lutheran clergyman, born at Staunton, Va., February 24, 1843. He was pastor of churches in Philadelphia, Savannah, Ga., and New York. In 1911 he was elected president of the General Synod of the Evangelical Lutheran Church in the United States of America. He wrote *Eucken and the Problem of Life, What the World Owes Luther, Light on the Shadows of Life*, etc.

Reményi (re'mān-ye), EDUARD, a Hungarian violinist, born at Heves, in 1830; died at San Francisco, California, May 15, 1898. He studied under Joseph Böhm at the Vienna Conservatory, but was obliged to flee from Hungary for his part in the insurrection against Austria in 1849. The following year he came to the United States, where he continued his studies, and gave his first recitals. He was appointed solo violinist to Queen Victoria of England in 1853. In 1860 he returned to Hungary, where he won great fame, and began a series of professional tours that took him all over the world.

Remigius (re-mij'us), SAINT, apostle of the French nation; bishop of Rheims. Born in 438; died at Rheims, January 13, 533.

Remington, FREDERIC, an American illustrator, sculptor and author, born at Canton, N. Y., Oct. 4, 1861; died at Ridgefield, Conn., Dec. 26, 1909. He is best known for his pictures of horses and western scenes. His sculptures include *The Broncho Buster* and *The Wounded Bunkie*. He wrote and illustrated *Pony Tracks, Crooked Trails, Frontier Sketches*, etc.

Remington, PHILO, an American inventor, born at Litchfield, N. Y., in 1816; died in 1889. For 25 years he was superintendent in the small arms factory of his father, and by his inventive skill perfected the Remington breech-loading rifle and the Remington typewriter.

Remiremont (rė-mēr-moṇ), a town of France, department of the Vosges, picturesquely situated at the foot of the Vosges, on the left bank of the Moselle. It is famous for its muslin, lace, etc., with a considerable trade, principally in cheese. Pop. 11,000.

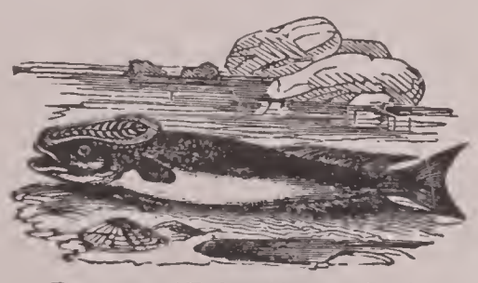
Remittent Fever (re-mit'tent), a fever which suffers a decided remission of its violence during the course of the twenty-four hours, but without entirely leaving the patient. It differs from an intermittent fever in this, that there is never a total absence of fever. Remittent fever is

severe or otherwise according to the nature of the climate in which the poison is generated. The autumnal remittents of temperate climates are comparatively mild, while the same fever in the tropics is often of a very severe type, and not unfrequently proves fatal. The period of remission varies from six to twelve hours, at the end of which time the feverish excitement increases, the exacerbation being often preceded by a feeling of chilliness. The abatement of the fever usually occurs in the morning; the principal exacerbation generally takes place towards evening. The duration of the disease is generally about fourteen days, and it ends in a free perspiration, or may lapse into a low fever. This fever is often cured by the administration of quinine, which should be given at the commencement of the remission. A simple yet nourishing diet must also be attended to. No stimulants must be allowed.

Remo, San. See *San Remo.*

Remon'strants. See *Arminians.*

Remora (rem'u-ra), a genus of fishes included in the Goby family, and of which the common remora (*Echenēis remŏra*), or sucking-fish, is the typical example. These fishes have on the top of the head a peculiar sucking-disk, composed of a series of cartilaginous plates arranged transversely, by means of which they attach themselves to other



Remora (*Echenēis remŏra*).

fishes or to the bottoms of vessels. The common remora attains an average length of one foot and possesses a general resemblance in form to the herring. It is common in the Mediterranean Sea and in the Atlantic Ocean. Other species are of larger size. The ancients attributed to the remora the power of arresting and detaining ships in full sail.

Remscheid (rem'shīt), a town of Rhenish Prussia, 18 miles E. S. E. Düsseldorf, mostly on a rugged height. It is the chief seat of the German hardware industry. Pop. 72,176.

Remsen (rem'sen), Ira, chemist, born at New York in 1846. He was graduated in the N. Y. College of Physicians and Surgeons, was professor of chemistry at Williams College 1872-76, and at Johns Hopkins University after 1876. In 1901 he succeeded Daniel E. Gilman as president of the latter institution. He wrote numerous text books, including *The Principles of Theorctical Chemistry, Inorganic Chemistry,* and *Chemical Experiments.*

Remus. See *Romulus.*

Rémusat (rā-mû-zä), Charles François Marie, Comte de, politician and man of letters, was born at Paris in 1797; died in 1875. He was educated at the Lycée Napoléon, and entered life as a journalist and lawyer. He was a member of the Chamber of Deputies from 1830 to 1848, was minister of the interior for a few months in 1840, and minister of foreign affairs in 1871-73, in both cases in the cabinet of M. Thiers. During the second empire he lived in retirement, devoting himself chiefly to literary pursuits. His works include several on English subjects, such as *L'Angleterre au XVIII Siècle* (1856), *Bacon* (1857), *Lord Herbert of Cherbury* (1874), *Histoire de la Philosophie en Angleterre depuis Bacon jusqu'à Locke* (1875).— His mother, Claire Elizabeth de Vergennes, Comtesse de Rémusat (born in 1780; died in 1824), was a very remarkable woman. Her essay on *Female Education,* published after her death, received an academic *couronne,* and her *Mémoires,* published in 1879-80, are particularly valuable for the light which they throw on the court of the first empire.

Rémusat (rā-mû-zä), Jean Pierre Abel, a French orientalist, born in 1788. He studied medicine, but devoted himself principally to the study of Eastern languages, especially Chinese. In 1811 appeared his *Essai sur la Langue et la Littérature Chinoises,* which attracted the attention of the learned. In 1814 he was appointed professor of Chinese and Manchu at the Collège de France, a chair established specially for him. He died in 1832.

Renaissance (re-nā'sans), a term applied, in its more specific sense, to a particular movement in architecture and its kindred arts, but in a general sense to that last stage of the middle ages when the European races began to emerge from the bonds of ecclesiastical and feudal institutions, to form distinct nationalities and languages; and when mediæval ideas became largely influenced by the ancient classical arts and literature. It was a gradual

transition from the middle ages to the modern, characterized by a revolution in the world of art and literature brought about by a revival and application of antique classical learning. The period was also marked by a spirit of exploration of lands beyond the sea, by the extinction of the scholastic philosophy, by the new ideas of astronomy promulgated by Copernicus, and by the invention of printing and gunpowder, etc.

Renaissance Architecture, a style which originated in Italy in the first half of the fifteenth century, and afterwards spread over Europe. Its main characteristic is a return to the classical forms and modes of ornamentation which had been displaced by the Byzantine, the Romanesque, and the Gothic. The Florentine Brunelleschi (died 1446) may be said to have originated the style, having previously prepared himself by a careful study of the remains of the monuments of ancient Rome. His buildings are distinguished by the use of the three classical orders, with much of the classical severity and grandeur, but in design they are made conformable to the wants of his own age. He sometimes retains, however, elements derived from the style which he superseded; as for instance in his masterpiece, the cathedral of Florence, where he makes a skilful use of the pointed Gothic vault. From Florence the style was introduced into Rome, where the noble and simple works of Bramante (died in 1514) are among the finest examples of it, the chief of these being the palace of the Chancellery, the foundations of St. Peter's, part of the Vatican, the small church of San Petro in Montorio. It reached its highest pitch of grandeur in the dome of St. Peter's, the work of Michael Angelo (died in 1564), after whom it declined. Another Renaissance school arose in Venice, where the majority of the buildings of the sixteenth and seventeenth centuries are distinguished by the prominence given to external decoration by means of pillars and pilasters. From this school sprung Palladio (1518-80), after whom the distinctive style of architecture which he followed received the name of Palladian. The Renaissance architecture was introduced into France by Lombardic and Florentine architects about the end of the sixteenth century, and flourished there during the greater part of the following century, but especially in the first half under Louis XII and Francis I. The early French architects of this period, while adopting the ancient classical orders and other features of the new style, still retained many of the features of the architecture of the preceding ages; later on they followed classical types more closely, as in the palace of the Louvre. As applied to ecclesiastical edifices, the Renaissance style of architecture is charged in France as elsewhere with depriving them of religious character. Towards the end of the sixteenth century the Renaissance style degenerated in France as it had done in Italy, and after passing through the degenerate phase known as the Baroque style, it gave rise to the insipid and overdecorated productions of the so-called Rococo style. Into England the Renaissance style was introduced during the time of Elizabeth, and it is there represented by the works of Inigo Jones (1572-1652), Sir C. Wren (1632-1723), and their contemporaries, St. Paul's, London, being a grand example of the latter architect. A great many of the princely residences of Germany belong to the Renaissance style, but not to its best period. Renaissance architecture presents many phases and varieties of style. It has been much used in modern work. The prevailing style employed in the rebuilding of Paris is Renaissance.

Renaix (rē-nā; Flemish, *Ronse*), a town in Belgium, province of East Flanders, 24 miles south of Ghent; has manufactures of thread, lace, linen and woolen cloth, tobacco, etc. Renaix dates from the eighth century. Pop. (1904) 20,760.

Renan (rē-nän), JOSEPH ERNEST, orientalist, historian, and essayist, was born at Tréguier, in Brittany, Feb. 27, 1823, and studied at the seminary of St. Sulpice, Paris, but in 1845 gave up all intention of becoming a priest, and devoted himself to historical and linguistic studies, especially the study of oriental languages. In 1848 he obtained the Volney prize for an essay on the Semitic languages. In 1849 he was sent by the Academy of Inscriptions and Belles Lettres on a mission to Italy, and in 1860 on a mission to Syria. In 1862 he was appointed professor of Hebrew, Chaldee, and Syriac in the Collège de France, but the skeptical views manifested in his *Vie de Jésus* (1863) raised an outcry against him, and he was removed from his chair, to be restored again, however, in 1871. This work, the publication of which caused intense excitement throughout Europe, was the first part of a comprehensive work on the *History of the Origins of Christianity*, which includes *Les Apôtres* (1866), *St. Paul* (1867),

L'Antéchrist (1873), *Les Evangiles* (1877), *L'Église Chrétienne* (1879), and *Marc Aurèle* (1880), all written from the standpoint of one who disbelieves in the supernatural claims of Christianity. Renan's latest important work is the *History of the People of Israel till the Time of King David.* Other works are *Histoire Générale et Système Comparé des Langues Sémitiques.* and *Études d'Histoire Religieuse.* He became a member of the Academy in 1878. Died October 2, 1892.

Renard the Fox (ren'ard), the name of an epic fable in which the characters are animals, the fox being the hero, and which in various forms was extremely popular in Western Europe during the middle ages, and for many years afterwards. It is known in several forms, differing from each other in the episodes. In Latin it appears in a poem of considerable length belonging to about 1150; the oldest known German version is that of a minnesinger, Heinrich der Glichesære, belonging to a period not much later. An excellent Dutch version of the fable appeared in Flanders about 1250, under the title *Reinaert de Vos* ('Renard the Fox'), and this subsequently received modifications and enlargements. In 1498 a version in Low German, probably by Herman Barkhusen, a printer of Rostock, appeared. It was evidently taken from the prose version in Dutch, of which Caxton published an English translation. On this Low German version was founded Goethe's rendering (1794) into modern German hexameters. In France the history of Renard was enormously popular, and from the end of the twelfth to the middle of the fourteenth centuries many forms of it appeared. It relates the adventures of the fox at the court of the king of beasts, the lion, and details with great spirit and humor the cunning modes in which the hero contrives to outwit his enemies, and to gain the favor of his credulous sovereign. The poem may be regarded as 'a parody of human life.' There is no personal satire in it, but the allusions to the weak points in the social, religious, and political life of the time are numerous and unmistakable.

Rendsburg (rents'börg), a town of Prussia, in the province of Schleswig-Holstein, on the Eider, 54 miles N. N. W. of Hamburg. It is advantageously situated for trade, being connected with the North Sea by the Eider, and with the Baltic by the Eider Canal, and being on the line of the Kaiser Wilhelm canal. It has a thirteenth century church and a quaint old townhall. Pop. (1911) 17,315.

René (rė-nā'), or RENA'TUS I of Anjou, titular king of Naples, second son of Louis II of Naples, duke of Anjou, and Iolante, daughter of John, king of Aragon, was born at Angers in 1409. Having in 1420 married Isabella, daughter of Charles II, duke of Lorraine, on the death of his father-in-law in 1431 he laid claim to that dukedom; but Count Antony of Vaudemont, son of the brother of Charles II, contested his right, drove him out of Lorraine, captured him, and held him a prisoner for several years. In 1434 his elder brother, Louis III of Anjou, who had been in actual possession of the throne of Naples and Sicily, died and left to him Provence, Anjou, Naples, Sicily, and Jerusalem. In 1437 René bought his liberty and the acknowledgment of his right to Lorraine for 400,000 florins, and in the following year he led an army to Naples, where his claims were disputed by Alfonso, king of Aragon. René was unsuccessful, and in 1442 returned to Lorraine, the government of which he gave up to his son John, who, after his mother Isabella's death, entered into full possession under the title of John II. On this René retired into Provence, and devoted himself to agriculture, manufactures, literature, and art. His subjects called him the Good, and his court was the resort of poets and artists. His closing years were spent in the company of his daughter Margaret, the exiled queen of Henry VI of England. His sons having all died before him, he made a will in favor of Louis XI of France, and at his death, which took place at Aix in 1480, most of his possessions fell to the French crown.

Renfrew (ren'frū), or RENFREWSHIRE, a county of Scotland, bounded by Ayrshire, Lanarkshire, Dumbartonshire, and the river and Firth of Clyde; area, 240 sq. miles. The surface is uneven, the highest point being about 1300 feet above sea level. Its principal rivers are the White Cart, Black Cart and Gryffe. The southeast part of the country is included in the great coal district of the west of Scotland. Good freestone for building is quarried. Renfrewshire derives its principal importance from its manufactures and shipping, including as it does Paisley, Greenock, and Port-Glasgow, as well as the county town, Renfrew. Pop. 268,900.— The town of Renfrew is an ancient royal and parliamentary burgh, 6 miles W. N. W. of Glasgow, close to the

Clyde. It has iron works and shipbuilding yards. Pop. 12,565.

Renfrew, a town of Renfrew Co., Ontario, Canada, on the Bonnechere River, in a lumber and grain district, with good water power. Pop. 6611.

Reni. See *Guido Reni.*

Rennell (ren'el), JAMES, an English geographer, born in 1742; died in 1830. At thirteen he entered the navy, whence he passed into the East India Company's military service, in which he rose to the rank of major. He was chiefly employed in engineering and surveying work, and later held the appointment of surveyor-general of Bengal. He retired on a pension in 1776, returned to England in 1778, and henceforth lived in London. The remainder of his long life he devoted to geographical labors, maintaining a correspondence with many of the most learned men of Europe, and giving to the world from time to time numerous geographical works of great value. These include *Bengal Atlas, Memoir of a Map of Hindustan, Geographical System of Herodotus, Treatise on the Comparative Geography of Western Asia, On the Topography of the Plain of Troy, Illustrations of the Expedition of Cyrus,* etc.

Rennes (renn), a city of France, formerly capital of Brittany, at present capital of the department of Ille-et-Vilaine, situated at the confluence of the rivers Ille and Vilaine. It is traversed from east to west by the Vilaine, which divides it into the High and the Low Town, and is crossed by four bridges. The High Town is handsome and regular, having been rebuilt after a dreadful conflagration which took place in 1720. The most remarkable buildings are the cathedral, a modern Grecian building, the Palais de Justice, the Hôtel de Ville, and the Lycée. The industries include sail-cloth, linen, shoes, hats, stained paper, etc. Rennes is the seat of an archbishop, the headquarters of a corps d'armée, and has a large arsenal and barracks. Duguesclin and Sainte Foix were born here. Pop. 79,372.

Rennet (ren'et), the prepared inner surface of the stomach of a young calf. It contains much pepsin, and has the property of coagulating the casein of milk and forming curd. It is prepared by scraping off the outer skin and superfluous fat of the stomach when fresh, keeping it in salt for some hours, and then drying it. When used a small piece of the membrane is cut off and soaked in water, which is poured into the milk intended to be curdled.

Rennet, or REINETTE, a kind of apple, said to have been introduced into England in the time of Henry VIII. It is much grown in France and Germany. The rennet is highly esteemed as a dessert fruit.

Rennie (ren'nē), GEORGE, civil engineer, eldest son of John Rennie (see next article), was born in Surrey in 1791, and was educated at St. Paul's School, London, and at Edinburgh University. In 1811 he became associated with his father in business, and on his father's death he formed a partnership with his brother John, and afterwards with his two sons. He constructed many of the great naval works at Sebastopol, Nicolaiev, Odessa, Cronstadt, and in the principal ports of England, and executed several English and continental railways. He died in 1866.

Rennie, JOHN, a celebrated civil engineer, son of a farmer, was born at Phantassie, East Lothian, in 1761, and was educated at Dunbar and Edinburgh, where he attended the lectures of Dr. Robinson and Dr. Black on natural philosophy and chemistry. He labored for some time after this as a workman in the employment of Andrew Meikle, a millwright. In 1780 he went to Birmingham, with letters of introduction to Messrs. Boulton and Watt at Soho, near that city, and by that firm he was afterwards employed in London in the construction of machinery for the Albion flour mills, near Blackfriars Bridge. In London his reputation rapidly increased, until he was regarded as standing at the head of the civil engineers of Great Britain. Numerous bridges, canals, docks, and harbors bear testimony to his skill. He died in 1821.

Reno (rē'nō), the largest city of Nevada, county seat of Washoe Co., on Truckee River, 31 miles N. of Carson City. It is the seat of the University of Nevada, and has an agricultural experiment station, State hospital for mental diseases, and other institutions. It has 35 manufacturing industries, and is the headquarters for the government Aerial Mail Service for the western district. The climate is dry and healthful. Irrigation of the district is effected by the Truckee-Carson Canal. Pop. (1910) 10,867; (1920) 12,016.

Renovo (re-nō'vo), a borough of Clinton Co., Pa., on Susquehanna River, 28 miles N. W. of Lock Haven, in a coal and fire-clay region. It has car

shops and is a summer resort. Pop. (1920) 5877.

Rensselaer (ren'sel-er), a city of Rensselaer Co., New York, on the Hudson River, opposite Albany, with which it is connected by bridges. It has felt mills, color and medicinal works, railroad and machine shops, shirt and shirtwaist factories, paper and cloth mills. Pop. (1920) 10,823.

Rent, in the strict economic sense, the payment which, under conditions of free competition, an owner of land can obtain by lending out the use of it to others. This will be found to consist of that portion of the annual produce which remains over and above the amount required to replace the farmer's outlay, together with the usual profits. The explanation of the existence of a permanent surplus in the product beyond what is thus needed to replace with profits the productive outlay was first given by Anderson in 1777, the theory being developed more at length by Ricardo, with whose name it is commonly associated. In Adam Smith's opinion, the demand of food is always so great that agricultural produce can command in the market a price more than sufficient to maintain all the labor to bring it to market and to replace stock with its profits, the surplus value going naturally to the landlord. As against the insufficiency of this statement to meet the central difficulty in the problem, the Ricardian school of economists pointed out that agricultural produce is raised at greater or less cost according to the degree of fertility of different soils, and that even on the same soil, by the law of diminishing returns, a more than proportionate outlay is, after a certain point, required for each additional increase in the produce. The uniform price of agricultural produce, however, as determined in a free market, tends inevitably to be such as to cover with ordinary profits the cost of that portion of the produce which is raised at greatest expense; and there will, therefore, be on all that portion of the produce raised at less expense a surplus over and above what is required to remunerate the farmer at the usual rate of profits. As a corollary to this theory, it will be apparent that rent does not determine the normal value of produce, but is itself determined by it; in other words, that rent is not an element in the cost of production. The Ricardian theory of rent has been frequently called in question, as by Rogers in England and Carey in America; but it has obtained, with certain obvious limitations in respect of the conditions of land tenure, the assent of the majority of modern economists.

Rent, as a legal term, is the consideration given to the landlord by a tenant for the use of the lands or buildings which he possesses under lease. There is no necessity that this should be, as it usually is, money; for horses, corn, and various other things, may be, and occasionally are, rendered by way of rent; it may also consist in manual labor for the landlord's benefit. It is incidental to rent that the landlord can distrain — that is, seize and sell the tenant's chattels in order to liquidate the rent. Sometimes the owner transfers to another by deed or otherwise the right to a certain rent out of the lands, that is termed a *rent-charge*, and the holder of it has power to distrain for the rent, though ordinarily he has no right over the lands themselves.

Renwick (ren'wik), JAMES, a Scottish Covenanter, born at Minnihive, Dumfriesshire, in 1662. He studied at Edinburgh University, where, on declining to take the oath of allegiance, he was refused a degree. On the advice of the Covenanters, with whom he threw in his lot after the execution of Cargill in 1681, he went to Holland, and was ordained at Groningen, immediately returning to Scotland, and engaging in the difficult and dangerous duties of a minister of the 'hill-folk.' On the proclamation of James II in 1685 he went with 200 men to Sanquhar, and published a declaration disowning him as a papist, and renouncing his allegiance. A reward was then set upon his head, and after many wonderful escapes he was captured, condemned, and executed, Feb, 17, 1688.

Renwick, JAMES, physicist, born at Liverpool in 1792; died at New York in 1863. He was educated in Columbia College, New York, and from 1820 to 1850 was professor of physics and chemistry in that institution. He wrote a number of works connected with the sciences in which he had to give instruction, such as *Outlines of Natural Philosophy; Treatise on the Steam Engine; Elements of Mechanics*, etc.; also *Life of John Jay and Alexander Hamilton; Life of De Witt Clinton;* besides editing various other works.— His son JAMES, born 1819, became a distinguished architect, designing many churches and other buildings, including the Roman Catholic cathedral of New York, the Smithsonian Institution, Vassar College, etc.

Rep, or REPP, a woolen dress fabric with a finely-ribbed surface, so

woven that the ribs run transversely and not lengthways as in corded fabrics.

Repairs (re-pārz'), in law, is the term denoting the repairs done to a house or tenement by the landlord or tenant during the currency of a lease. In England, unless there is an express stipulation to the contrary, repairs must be performed by the tenant; but it is usually stated in the lease which party is to do the repairs. In the United States, unless otherwise stipulated, repairs are made by the landlord; he must keep the property in tenantable condition.

Repeal Movement (re-pēl'), the name given to the agitation for the repeal of the Union between Great Britain and Ireland. This agitation commenced almost at the moment of the Union, and has continued to the present time. Robert Emmet sacrificed his life to the cause of repeal in 1803. But the word repeal is most intimately connected with the name and career of Daniel O'Connell, the Irish 'Liberator.' O'Connell died in 1847, and the cause of repeal was taken up by the Young Ireland party of 1848; by the Fenians, whose operations came to a head in 1865-67; and finally by the Home Rule party, organized under the leadership first of Isaac Butt, in 1870, and afterwards under the leadership of C. S. Parnell. During the celebrated Parnell Commission of 1888-89, however, the Home Rule party, through their counsel, disclaimed all desire for repeal, maintaining that their aims were confined to the obtaining of Home Rule in the strict, or restricted, sense of the word. A bill in favor of home rule in Ireland was finally passed in 1914, but the war in Europe delayed its establishment.

Repeat (re-pēt'), in music, a sign that a movement or part of a movement is to be played or sung twice.

Repeater Watch, a watch that repeats the hour, striking the hour, or hour and quarters, or even the hour, quarters, and odd minutes on the compression of a spring.

Repeating Pistol. See *Revolver.*

Replevin (re-plev'in), in English law, is an action brought to recover possession of goods illegally seized, the validity of which seizure it is the regular mode of contesting.

Replica (rep'li-ka), in the fine arts, is the copy of a picture, etc., made by the artist who executed the original.

Reporting (re-pōr'ting), is the process by which legislative debates and other public addresses are made known to the public. Previous to the year 1711 no regular publication of reports can be said to have been made. After 1711 speeches in the British Parliament, reproduced from notes furnished sometimes by the members themselves, began to appear regularly in periodicals. *Boyer's Historical Register,* an annual publication, gave a pretty regular account of the debates from the accession of George I to the year 1737. In 1735 the *Gentleman's Magazine* began a monthly publication of the debates, the names of the speakers being suppressed, with the exception of the first and last letters; but the reports were necessarily very inaccurate, as may be judged from the manner in which they were prepared. Cave, the bookseller, and his assistants gained admission to the houses of parliament, and surreptitiously took what notes of the speeches they could, and the general tendency and substance of the arguments; this crude matter was then brought into shape for publication by another hand — work upon which Guthrie the historian and Dr. Johnson were employed. In 1729, and again in 1738, the House of Commons had characterized the publication of debates as 'an indignity to, and a breach of the privilege of this house,' and in 1747 Cave was called to account; but the reports continued to appear without the proper names of the speakers, and under the heading of 'Debates in the Senate of Lilliput.' In 1771 several printers were ordered into custody for publishing debates of the House of Commons. The sympathy of the public was with the printers, the lord mayor and Alderman Oliver were committed to the Tower for refusing to recognize the Speaker's warrant for the arrest of the printers, and the popular excitement was intense; but in 1772 the newspapers published the reports as usual, and the House quietly gave up the struggle. Thenceforth the system of reporting parliamentary debates gradually developed till it reached its present very perfect condition. For a long time it was considerably hampered by the want of any special place in the house for the reporters; but in the new houses of parliament special galleries and rooms have been fitted up for them, and all necessary conveniences provided. The system quickly extended from England to the United States, in the Congress of which no restriction was laid upon reporters. *Verbatim* reports of the proceedings in the Senate and House of Representatives are taken daily in shorthand dur-

ing the sessions by an official corps of reporters and printed in the *Congressional Record.* The newspapers have their reporters also at hand to take down matters of interest to the general public, and the art of reporting has extended in this country until it covers lectures, debates and public speeches of every kind. Every newspaper has a corps of reporters devoted to these various duties, and nowhere else in the world is there such enterprise and activity shown in the gathering of news of this character as in the United States.

Reports (re-pōrts′), in regard to courts of law, are statements containing a history of the several cases, with a summary of the proceedings, the arguments on both sides, and the reason the court gave for its judgment. In England reports of law cases are extant from the reign of Edward II. Up to the time of Henry VIII the reports were taken officially at the expense of the government, and were published annually under the name of Year-books; but afterwards, until 1865, the reports were made by private individuals in the various courts. In 1865 an improved system of law reporting was instituted by the English bar under the superintendence of the Council of Law Reporting, who publish the 'authorized reports.' In the United States the Supreme Court Reports form a complete series from 1792 to date. Each State also publishes a regularly authorized series of Reports of decisions of its judicial tribunals of last resort.

Repoussé (rē-pö-sā′) a kind of ornamental metal-work in relief. It resembles embossed work, but is produced by beating the metal up from the back, which is done with a punch and hammer, the metal being placed upon a wax block. By this means a rude resemblance to the figure to be produced is formed, and it is afterwards worked up by pressing and chasing the front surface. The finest specimens of this style are those of Benvenuto Cellini of the sixteenth century.

Representative Government (rep-re-zen′ta-tiv), is that form of government in which either the whole of a nation, or that portion of it whose superior intelligence affords a sufficient guarantee for the proper exercise of the privilege, is called upon to elect representatives or deputies charged with the power of controlling the public expenditure, imposing taxes and assisting the executive in the framing of laws. The most notable example of a government of this kind is that existing in the United States. In Britain only the House of Commons is representative, the House of Lords being composed of hereditary legislators. In the nations of Europe also, except France and Switzerland, the legislative bodies are nowhere fully representative of the people. See *Constitution.*

Reprieve (re-prēv′), the suspension of the execution of the sentence passed upon a criminal for a capital offense. A reprieve may be granted in various ways: — First, by the mere pleasure of the executive; second, when the judge is not satisfied with the verdict, or any favorable circumstance appears in the criminal's character; third, when a woman capitally convicted pleads pregnancy; and, finally, when the criminal becomes insane.

Repri′sal, Letters of. See *Marque, Letters of.*

Reprobation (rep-ru-bā′shun), in theology, is the doctrine that all who have not been elected to eternal life have been reprobated to eternal damnation. This doctrine was held by Augustine and revived by Calvin; but most modern Calvinists repudiate it in the sense usually given to it.

Reproduction (rē-pru-duk′shun), the process by which animals perpetuate their own species or race. Reproduction may take place in either or both of two chief modes. The first of these may be termed *sexual,* since in this form of the process the elements of sex are concerned — male and female elements uniting to form the essential reproductive conditions. The second may be named *asexual,* since in this latter act no elements of sex are concerned. The distinctive character of sexual reproduction consists in the essential element of the male (*sperm-cell* or *spermatozoön*) being brought in contact with the essential element of the female (*germ-cell, ovum,* or *egg*), whereby the latter is fertilized or impregnated, and those changes thereby induced which result in the formation of a new being. Whether these elements, male and female, be furnished by one individual or by two — or in other words whether the sexes be situated in separate individuals or not — is a fact of immaterial consequence in the recognition and definition of the sexual form of the process. The reproductive process, therefore, may be (I) *Sexual,* including (A) Hermaphrodite or Monœcious parents possessing male and female organs in the same individual, and these may be (*a*) self-impregnating (for example, the tape-worm), or (*b*) mutually impregnating

(for example, the snail); and (B) Diœcious parents, which may be (1) Oviparous (for example, most fishes, birds, etc.), (2) Ovo-viviparous (for example, some amphibians and reptiles), or (3) Viviparous (for example, mammals). Or the reproductive process may be (II) *Ascœual*, including the processes of (A) Gemmation or budding (internal, external, continuous, or discontinuous), and (B) Fission (transverse, longitudinal, irregular).

The most perfect form of the reproductive process is best seen in the highest or vertebrate animals, where the male elements are furnished by one individual and the female elements by another. The male element, with its characteristic sperm-cells or spermatozoa, is brought into contact with the female ova in various ways. The ova when impregnated may undergo development external to the body of the parent, and be left to be developed by surrounding conditions (as in the eggs of fishes); or the parent may (as in birds) incubate or hatch them. Those forms which thus produce eggs from which the young are afterwards hatched are named *oviparous* animals. In other cases (as in the land salamanders, vipers, etc.) the eggs are retained within the parent's body until such time as the young are hatched, and these forms are hence named *ovo-viviparous;* while (as in mammalia) the young are generally completely developed within the parent's body, and are born alive. Such animals are hence said to be *viviparous.* In the higher mammals, which exhibit the viviparous mode of reproduction in fullest perfection, the mother and embryo are connected by a structure consisting partly of fœtal and partly of maternal tissues, and which is known as the *placenta.* (See *Placenta.*) In the tapeworms we find familiar examples of normal hermaphrodite forms. Each segment or *proglottis* of the tapeworm — which segment constitutes of itself a separate zoöid or part of the compound animal — contains a large branching ovary, developing ova or eggs, and representing the female organs, and also the male organ or testis. These organs between them produce perfect or fertilized eggs, each of which under certain favorable conditions is capable of developing into a new tapeworm. The snails also form good examples of hermaphrodite animals, and illustrate organisms which require to be mutually impregnated in order to produce fertilized eggs — that is to say, the male element of one hermaphrodite organism must be brought in contact with the female element of another hermaphrodite form before the eggs of the latter can be fecundated. See also *Fission, Gemmation, Generation, Ovum, Parthenogenesis,* etc. As to reproduction in plants, see *Botany.*

Reptile (rep'til), or REPTILIA, a class of vertebrates, constituting with the birds, to which they are most closely allied, Huxley's second division of vertebrates, Sauropsida. Reptiles, however, are generally regarded as occupying a separate place in the animal kingdom, between birds and amphibians. Reptiles differ from amphibians chiefly in breathing through lungs during the whole period of their existence; and from birds in being cold-blooded, in being covered with plates or scales instead of feathers, and in the forelegs (as far, at least, as living reptiles are concerned) never being constructed in the form of wings.

The class may be divided into ten orders, four of which are represented by living forms, while six are extinct. The living orders are the Chelonia (tortoises and turtles), the Ophidia (serpents and snakes), the Lacertilia (lizards), and Crocodilia (crocodiles and alligators). The extinct orders are: Ichthyopterygia (Ichthyosaurus), Sauropterygia (Plesiosaurus), Anomodontia (Rhynchosaurus, etc.), Pterosauria (Pterodactylus), Deinosauria (Megalosaurus, etc.), and Theriodontia. The class is also divided into two sections, Squamata and Loricata, according as the exoskeleton consists simply of scales or of bony plates in addition to the scales.

The exoskeleton varies greatly in its development throughout the class. As in the tortoises and turtles and crocodiles it may attain either separately or in combination with the endoskeleton a high development. In serpents and many lizards it is moderately developed, while in some lizards the skin is comparatively unprotected. The skeleton is always completely developed and ossified. The vertebral column in the quadrupedal forms is divided into four or five regions, less distinctly differentiated, however, than in the mammals. The ribs differ considerably in their mode of attachment to the vertebræ, but are always present, and in a state of greater development than in the amphibians. The body, except in the case of the tortoises, is of an elongated form. The limbs are very differently developed in the different species. In the serpents and some lizards they are completely wanting or atrophied; in other lizards they are rudimentary; while in the remainder of the class sometimes the anterior and sometimes the posterior

limbs are developed, and not the others. In no case are the limbs developed to the extent to which they are developed in birds and quadrupeds, these members seldom being of sufficient length to keep the body from the ground. In some of the forms, living or extinct, the limbs are modified for swimming or for flight. The lower jaw is connected with the skull through the intervention of a quadrate bone, and, as this often projects backward, the opening of the mouth is very great, and may even extend beyond the base of the skull. Teeth, except in the turtles and tortoises, are present, but are adapted rather for seizing and holding prey than masticating food, and, except in the crocodiles, are not sunk in sockets. The skull possesses a single occipital condyle, by means of which it articulates with the spine. The brain is small compared with the size of the skull. The muscular system is developed more like that of the birds and mammals than that of the amphibians or fishes. The intestinal tract is generally differentiated into an œsophagus, stomach, small intestine, and large intestine. It terminates in a *cloaca*, which is also common to the efferent ducts of the urinary and generative systems. In some forms (as snakes) the stomach, like the gullet, is capable of great distention. The heart has only three cavities, viz., two separate auricles and a single ventricular cavity, usually divided into two by an incomplete partition. Respiration is always performed by the lungs, which are highly organized, and often attain a great size. The ova are in general retained within the body of the parent until the development of the young has proceeded to a greater or less extent, and then expelled and left to the heat of the sun; but in some forms (as snakes and lizards) they are hatched in the interior of the body. Reptiles are found in greatest number, and in most typical form and variety, in the warm or tropical regions of the earth. During winter, or in the colder seasons of the year, most reptiles hibernate, and snakes are notable as periodically molting their skin or epidermis. See the different orders in separate articles.

Republic (re-pub'lik; Latin, *res publica*, the common weal, the state), a commonwealth in which the supreme power of the state is vested, not in a hereditary ruler, but in the citizens themselves. According to the constitution of the governing body, a republic may vary from the proudest aristocracy to the most absolute democracy. In the small states of ancient Greece the supreme power was vested in the whole body of the citizens, who met in common assembly to enact their laws; though under them was a large slave population devoid of all political rights. In the oligarchic republics of Genoa and Venice the supreme power was consigned to the nobles or a few privileged individuals. In all modern republics the representative system prevails. Besides the diminutive republics of San Marino, in Italy, and Andorra, on the south side of the Pyrenees, the republics in Europe at the present day are those of Switzerland, France and Portugal. Switzerland has been a republic ever since it liberated itself from German rule; and France has been thrice a republic—from 1793 to 1804, from 1848 to 1852, and after 1870. Holland was a republic from the separation of the seven provinces from Spain until 1815; Great Britain was nominally a republic from 1649 to 1660; Spain possessed a brief republican government, and Portugal has had once since 1910. In the New World the republican form of government prevails universally among the independent states, the most important of all the republics there being the United States. The United States, like Switzerland, is a federative republic, consisting of a number of separate states united by a constitution, and having a central government, with power to enact laws binding on all the citizens. The same condition exists in others of the American republics. Argentine became a republic in 1816. Mexico has been a republic since 1824, except during the short-lived empire from 1863 to 1867. Brazil has been a republic only since November, 1889.

Republican Party, one of the two leading political parties of the United States. The term was first used shortly after the formation of the Constitution, to replace that of the old Anti-Federalist party, composed of those who were opposed to the adoption of this great state paper. The name Republican was given to the new organization by Thomas Jefferson, who became its leader. During the French Revolution many 'Democratic Clubs' were formed in this country, and during 1794-95 a union was made between these and the Republicans, the compound title of Democratic-Republican being adopted. The Federal party, to which this was opposed, died out after 1816, and the Democratic-Republican party existed alone. After 1824 it became known simply as the Democratic. In 1828 a National Republican party was formed, but this name gradually changed into that of Whig party. The Republican

party now existing in the United States was formed in 1856, out of an organization known as 'Anti-Nebraska Men,' who adopted this title. Into it was merged the remains of the older Whig, Free Soil, American and other minor organizations. The new party advocated a high protective tariff and favored a strong central government, in opposition to the Democratic policy, which opposed the protective tariff and maintained the doctrine of state-rights. The new party also advocated the non-extension of slavery, this also being in opposition to the policy of the Southern and a large section of the Northern Democrats. But the result of the Civil war removed the slavery issue from the domain of party politics and there remained only those of centralization and protection. In the years which have passed since the two parties have in a measure approached each other on these questions and the marked distinction between them has passed away, both of them, for instance, now advocating tariff reduction, though to a different extent. Other issues between the two parties have arisen from time to time, such as that of the gold and silver standard, but at present their difference in policy is far less strongly marked than formerly. The Republican party has been successful in electing all its candidates for the Presidency, except in 1856, 1884, 1892, 1912 and 1916.

Repudiation (re-pū-di-ā'shun), a refusal on the part of a government to pay the debts contracted by the governments which have preceded it. Repudiation has sometimes been resorted to by the smaller American republics and by some of the United States, and in Europe there are also instances of a similar kind.

Repulsion (re-pul'shun), in physics, is a term often applied to the action which two bodies exert upon one another when they tend to increase their mutual distance. It is manifested between two magnets when like poles are presented to each other, and by electrified bodies when like charges (positive to positive or negative to negative) are presented. There is no evidence of any other form of physical repulsion existing.

Requena (re-kā'nȧ), a town of Southern Spain, province of Valencia, 41 miles W. of that city; has industries connected with the culture of silk, saffron, grain, fruit and wine. Pop. 16,236.

Requiem (rē'kwi-em), in the Roman Catholic Church, a solemn musical mass for the dead, which begins in Latin, *Requiem æternam dona eis*, ('Give to them eternal rest'). Mozart, Jomelli, and Cherubini composed famous requiems.

Reredos (rēr'dos), in ecclesiastical architecture, a screen or partition wall behind an altar, which is invariably ornamented in some manner, and is frequently highly enriched with sculptured decorations, or with painting, gilding, or tapestry. The reredos of St Paul's, London, the last English cathedral to be provided with a reredos, was unveiled in January, 1888.

Rescript (rē'skript; Latin, *rescriptus*, written back), in Roman law, the answers of popes and emperors to questions in jurisprudence propounded to them officially; hence an edict or decree. The rescripts of the Roman emperors constitute one of the authoritative sources of the civil law. The rescripts of the popes concern principally theological matters.

Rescue (res'kū), in law, the forcible or illegal taking of a person or thing (as a prisoner or a thing lawfully distrained) out of the custody of the law.

Resection (re-sek'shun), in surgery, the operation of cutting out the diseased part of a bone at a joint. It frequently obviates the necessity of amputating the whole limb, and, by the removal of the dead parts, leaves the patient a limb which, though shortened, is in the majority of cases better than an artificial one. Resection, which is one of the triumphs of modern surgery, became a recognized form of surgical operation in 1850.

Reseda (re-sē'da), a genus of annual, biennial, and perennial herbs and undershrubs, nat. order Resedaceæ, of which it is the type. Of the genus two species are quite familiar: *R. odorāta* (mignonette) and *R. luteŏla* (wild woad). The latter yields a beautiful yellow dye, for which it was formerly cultivated.

Resedaceæ (re-se-dā'se-ē), a small natural order of plants, consisting of annual or perennial herbs, more rarely shrubs, with alternate or pinnately divided leaves, and small, irregular, greenish-yellow or whitish flowers. It inhabits Europe and all the basin of the Mediterranean. With the exception of *Resēda odorāta* (mignonette) and *R. luteŏla* (wild woad), most of the species are mere weeds.

Reservation (res-er-vā'shun). This term is used in the United States to designate a tract of the public land set aside for some special

use. In some of the States considerable tracts have been thus donated for the support of public schools. Much larger tracts have been set aside for the use of Indian tribes, which have been removed to these locations, supported by the government and kept under supervision. The most notable of these reservations was the Indian Territory, now the State of Oklahoma but still largely inhabited by Indian tribes. Other large reservations have been set aside, especially in the West, and the system has given rise to many evil practices, in which the Indians have been oppressed and robbed by dishonest agents and others. These evils are gradually being eliminated.

Reserve (re-zerv'), in military matters, has several significations. In battle the reserve consists of those troops not in action, and destined to supply fresh forces as they are needed, to support those points which are shaken, and to be ready to act at decisive moments. The reserve of ammunition is the magazine of warlike stores placed close to the scene of action to allow of the supply actually in the field being speedily replenished. The term reserves is also applied to those forces which are liable to be called into the field on great emergencies, for the purposes of national defense; which have received a military training but follow the ordinary occupations of civil life, and do not form part of the standing army. Such reserves now form a part of all national troops organized on a great scale. Liability to serve in the reserves continues generally from about the age of twenty to forty-two. In Great Britain the reserves consist of the army reserve and the auxiliary forces, namely, the militia, the yeomanry, and the volunteers. In the United States the National Guards of the States constitute such a reserve. (See *Army*, *Militia*, *Naval Reserve*, etc.)

Reserve, in banking and insurance, that portion of capital which is set aside to meet liabilities, and which, in banking, is therefore not employed in discounts or temporary loans.

Reservoir (rez'ér-vwâr), an artificial basin in which a large quantity of water is stored. The construction of a reservoir often requires great engineering skill. In the selection of a site the great object should be to choose a position which will give the means for collecting a large supply of rainfall with as little recourse as possible to artificial structures or excavations. The embankments or dams may be constructed either of masonry or earthwork. Reservoirs in which the dams are built of earthwork must be provided with a waste-weir, to admit of the surplus water flowing over; in the reservoirs of which the dams are built of masonry there is no necessity for a waste-weir, as then the water may be allowed to overflow the wall, there being no fear of its endangering the works. The outlet at the bottom, by which the water to be used is drawn off from the reservoir, may consist either of a tunnel, culvert, or iron pipes provided with suitable sluices. A vast system of reservoirs, called 'tanks,' exists in India, constructed for purposes of irrigation. The reservoirs upon the irrigation canals of Spain are all of masonry; they are circular or polygonal in shape, and the interior face of the wall, which is constructed of large ashlars, is vertical. In various other countries the preference is given to earthen dams. In the Western United States a series of immense reservoirs are now in process of construction, in which the waters of mountain streams are held back by great stone dams built across their outlets. These are intended for irrigation purposes, for the reclamation of great areas of sterile lands. In these cases means are adopted for raising or lowering the surface of the water, the difference between the lowest and the highest level of the surface, multiplied by the area of the lake, giving the measure of its available storage. Distributing reservoirs for towns are generally built of masonry, but are sometimes of iron. They are placed high enough to command the highest part of the town, and are capacious enough to contain half a day's supply, their chief use being to store the surplus water during the night. Reinforced concrete is now frequently employed in the building of reservoir dams. Several catastrophes have occurred from the bursting of imperfectly formed reservoirs. The bursting of the reservoir at Johnstown, Pennsylvania, in 1889 was a notable instance of this kind, 2200 persons being drowned and $10,000,000 worth of property destroyed. The breaking of a concrete dam at Austin, Pennsylvania, in 1911, led to the death of hundreds of persons and the loss of thousands of dollars' worth of property. See *Johnstown*.

Reshid Pasha (re-shēd' pá'shå), a Turkish statesman, born at Constantinople in 1800; died in 1858. He represented the Porte in the courts of France and Britain, was several times made grand vizier, supported the policy of Sir Stratford Canning, and

was the chief of the party of progress in Turkey.

Resht (resht), a town of Persia, capital of the province of Gilan, 150 miles northwest of Teheran, near the Caspian Sea. Resht is a well-built town, and is the center of the silk trade of Persia, and through its port Enzelli, 16 miles distant, carries on a considerable trade with Russia. Pop. 41,000.

Residuary Legatee (re-zid'ū-a-ri leg'a-tē), in law, the person to whom the surplus of the personal estate, after the discharge of all debts and particular legacies, is left by the testator's will.

Resina (rā-sē'na), a town of Italy, in the province and 6 miles southeast of Naples, on the Gulf of Naples. It is built over the ruins of Herculaneum, and is the usual starting-place for the ascent of Vesuvius. Pop. 19,766.

Resins (rez'inz), a class of vegetable substances insoluble in water, soluble in alcohol, and easily softened or melted by heat. Resins are either neutral or acid; they are transparent or translucent; they have generally a yellow-brown color; are sometimes elastic, but more generally friable and hard. They become electric when rubbed. Resins may be divided into three classes: — (1) Those which exude spontaneously from plants, or from incisions in the stems and branches. They are generally mixtures of gum-resins and volatile oils. The principal resins belonging to this class are benzoin, dragon's-blood, Peru balsam, storax, copaiba, copal, elemi, guaiacum, jalap, lac, myrrh, sandarach, and turpentine. (2) Resins extracted from plants by alcohols; they generally contain definite carbon compounds. The principal resins belonging to this class are gum ammoniacum, angelica-root, Indian hemp, cubebs, manna, and squill. (3) Fossil resins, occurring in coal or lignite beds, amber, asphalt, copaline, fossil caoutchouc, etc.

Resist (re-zist'), in calico-printing, a paste applied to calico goods to prevent color or mordant from fixing on the parts not intended to be colored. Resists may be used either mechanically or chemically.

Resistance (re-zist'ans), ELECTRICAL, the opposition which a conductor offers to the flow of electricity, the conductor being removed so far from neighboring conductors that their action will be very small, and maintained at the temperature of 0° C. The unit of resistance now in use is called an ohm (which see).

Resolution (rez-u-lū'shun), in music, the movement of a dissonance into the consonant harmony for which it creates in the ear an expectation. This is effected by raising or depressing the note a tone or a semitone, according to the rules of harmonical progression.

Resonance (rez'u-nans), in acoustics, a strengthening of sound. Resonance includes such strengthening of sound as occurs in sounding-boards and the bodies of musical instruments.

Resonator (rez-u-nā'tur), a device for analyzing compound sounds and for detecting a particular note by sympathetic vibrations. It was invented by Helmholtz, and in its simplest form consists of a hollow bulb or round tube, with one aperture to be applied to the ear, and an opposite aperture of a certain size which serves to admit the vibrations of one musical note to which it is adapted and to exclude all others. A set of these may be formed each of which corresponds to a note of the musical scale.— ELECTRICAL. A conductor having one open circuit, designed for detecting the electromagnetic radiation from a nearby circuit, which is manifested by a spark, as a result of sympathetic electrical vibrations.

Resorcin (re-zor'sin), a colorless crystalline compound prepared on the large scale by the action of sulphuric acid on benzine, and by the treatment of the resulting compound with caustic soda. It yields a fine purple-red coloring matter and several other dyes used in dyeing and calico-printing.

Respiration (res-pi-rā'shun), the act of respiring or breathing. Respiration is that great physiological function which is devoted to the purification of the blood by the removal, through the media of the breathing organs, of carbonic acid and other waste products, and at the same time to the revivifying of the blood by the introduction of the oxygen of atmospheric air. It is thus partly excretory and partly nutritive in its character. The other waste products, besides carbonic acid, which are given off in the process of animal respiration, are water, ammonia, and organic matters; but carbonic acid is by far the most important.

In man and the higher animals respiration is carried on by the breathing organs or lungs. The blood is conveyed to the breathing organs by special vessels, the right side of the heart in birds and mammals being exclusively employed in driving blood to the lungs for purifica-

tion. The blood is sent through the pulmonary or lung capillaries in a steady stream, and passes through these minute vessels at a rate sufficient to expose it to the action of the oxygen contained in the air-cells of the lung. The essential part of the function of respiration, namely, the exchange of carbonic acid gas for oxygen, thus takes place in the lung, where the dingy-hued venous blood becomes converted into the florid red arterial blood. Respiration includes the physical acts of inspiration and expiration, both involuntary acts, although they may be voluntarily modified. From fourteen to eighteen respiratory acts take place per minute, the average quantity of air inhaled by a healthy adult man being about 30 cubic inches, a slightly smaller quantity being exhaled. This definite volume of air which ebbs and flows is termed *tidal* air. The quantity (about 100 cubic inches) which may be taken in a deep inspiration, in addition to the tidal air, is termed *complemental* air. The quantity of air (75 to 100 cubic inches) remaining in the chest after an ordinary expiration has expelled the tidal air is named *supplemental* or reserve air, and this may be in greater part expelled by a deeper expiration; while a quantity of air always remains in the lungs after the deepest possible expiratory effort, and cannot be got rid of. This latter quantity is therefore appropriately named *residual* air. The difference in the mode of breathing between the two sexes is clearly perceptible. In man it is chiefly *abdominal* in its character; that is to say, the lower part of the chest and sternum, together with the abdominal muscles, participate before the upper portions of the chest in the respiratory movements; while in women the breathing movements are chiefly referable to the upper portions of the chest. In women, therefore, breathing is said to be *pectoral.*

Every volume of inspired air loses from 4½ to 5 per cent. of oxygen and gains rather less carbonic acid. The quantity of carbonic acid given off varies under different circumstances. More carbonic acid is excreted by males than by females of the same age, and by males between eight and forty than in old age or in infancy. An average healthy adult man will excrete more than 8 oz. of carbon in 24 hours. Hence the necessity for repeated currents of fresh air in meeting places and places of public entertainment, in halls and in churches, and for the proper ventilation of sleeping apartments. The breathing of an atmosphere vitiated by organic matter and carbonic acid results in imperfect oxygenation of the blood, is accompanied or followed by headaches, drowsiness, and lassitude, and is the source of many serious and even fatal disorders.

While in man and the more highly organized animals respiration is carried on by the lungs, in fishes it is effected by the gills. The essential feature of any breathing organ is a thin membrane, having the blood on one side and air, or water containing air, on the other; and the essential feature of respiration is an interchange of products between the blood and the atmosphere, oxygen passing from the atmosphere or water into the blood, and carbonic acid and other excretory substances from the blood into the atmosphere or water. In the protozoa no respiratory organs are specialized, but the protoplasm of which the bodies of these animals are composed has doubtless the power of excreting waste matters, as well as of absorbing nutritive material. Even in comparatively high organisms, where no specialized breathing organs are developed, the function of respiration may be carried on by the skin or general body surface — the integument being, as in the highest forms, intimately correlated in its functions to the breathing process. Thus in earthworms, lower crustacea, etc., the breathing appears to be solely subserved by the body-surfaces.

Respiration goes on in plants as well as in animals, the plant in the presence of light exhaling oxygen and inhaling carbonic acid, and thus reversing the action of the animal.

Respiration, ARTIFICIAL. See *Drowning.*

Respirator (res-pi-rā'tur), a mouth-covering, which gives warmth to the air inhaled, and is used by persons having delicate lungs. It is constructed of a series of layers of very fine silver or gilt wires placed closely together, which are heated by the exhalation of the warm breath, and in turn heat the cold air before it is inhaled. Other respirators, designed to exclude smoke, dust, and other noxious substances, are used by firemen, miners, cutlers, grinders, and the like. Recently a form of respirator has been adopted by divers in which a store of compressed air or oxygen is contained in the helmet for breathing purposes. A similar expedient has been adopted by firemen and those entering mines after an explosion to avoid the breathing of vitiated air or poisonous gases.

Respir'atory Sounds, in medicine, the

sounds made by the air when being inhaled or exhaled, as heard by the ear applied directly to the chest, or indirectly through the medium of the stethoscope. The respiratory sounds are of the highest importance in the diagnosis of diseases of the chest and bronchial tubes.

Respite (res'pit), the temporary suspension of the execution of a capital offender. See *Reprieve.*

Respondent (re-spon'dent), in law, the designation of the party requiring to answer in a suit, particularly in a chancery suit.

Respondentia (res-pon-den'shi-a), a loan on the security of a ship's cargo. It is made on the condition that if the goods are lost, the lender shall lose his money. A similar loan on the security of the ship itself is called *bottomry.*

Rest, in music, an interval of silence between two sounds, and the mark which denotes such interval. Each note has its corresponding rest. See *Music.*

Rest-harrow, a common European leguminous plant (*Onōnis spinōsa*), akin to the brooms. It is plentiful in stiff clay land in some parts, and derives its name from its long and strong matted roots arresting the progress of the harrow. The stems are annual, often woody or shrubby, and hairy; the leaves are generally simple, entire towards the base; the flowers, mostly solitary, large, and handsome, are of a brilliant rose color. Rest-harrow is also called *cammock.*

Restiaceæ (res-ti-ā'se-ē), a natural order of plants allied to the Cyperaceæ or sedges, and confined to the southern hemisphere, being found chiefly in South Africa and Australia. They are herbs or undershrubs, with matted roots which bind shifting soil, hard wiry stems, simple narrow leaves, the sheaths of which are usually split, and inconspicuous brown rush-like panicles of flowers. *Restio tectorum* is employed in South Africa for thatching, and the stems of other species are manufactured into baskets and brooms.

Restigouche (res'ti-gösh), a river which separates New Brunswick from the province of Quebec, flowing N. E. into the Bay of Chaleurs at Dalhousie. It is 200 miles long, is navigable for 16 miles to Campbelton, and forms a tidal estuary for 24 miles. It drains 4000 square miles, and its basin supplies great quantities of timber.

Restoration (res-tu-rā'shun), in English history, the re-establishment of Charles II on the throne, May 29, 1660. The restoration was held as a festival in the Church of England till 1859.

Restorationist (res-tur-ā'shun-ist), one who believes in a temporary future punishment, but in a final restoration of all to the favor and presence of God. The name is applied to all of whatever sect who hold this belief, including the Universalists and especially a particular sect of Universalists.

Resurrection (res-u-rek'shun), the rising again of the body from the dead to be reunited to the soul in a new life. It has formed a part of the belief of the Christian Church since its first formation, and has been embodied as an article in each of the creeds. There are traces to be found of such a belief among heathen nations from a very early period. There can be little doubt that the Jews of later times held the doctrine, though it would be difficult to point to any express indication of it in the Old Testament. It appears, however, to be alluded to in Isaiah, xxvi, 19, and is distinctly affirmed in Daniel, chap. xii, 1-3. That the belief in the resurrection was generally held among the Jews at the time of Christ is evident, particularly from the position occupied by the Sadducees, a sect having as its most characteristic feature the denial of the resurrection. Beyond doubt, however, it was the gospel that 'brought life and immortality to light.' At best the notions of a resurrection and future state current prior to the advent of Christ were dim and undefined. With regard to the information conveyed to us in the New Testament on the doctrine of the resurrection, we are taught that it will be *universal*, extending to the wicked as well as to the righteous, John, v, 28, 29; Rev., xx, 13; that there shall be identity, in some sense, between the body which died and the body which shall be raised, 2 Cor., v, 10; that, as regards the resurrection of the righteous, the body, though identical, shall be wonderfully altered, Phil., iii, 21; 1 Cor., xv; Luke, xx, 35, 36; and that, as regards the time of the resurrection, it shall be at the end of this present earthly state, and that it shall be connected with the coming of our Lord to judge the world, 1 Thess., iv, 16.

Connected with this subject is the resurrection of Christ himself from the dead, the cornerstone of the Christian system. The evidence in support of it is marked by the following characteristics: — (1) *The variety of circumstances* under which the risen Saviour appeared.

(2) *The circumstantiality* of the testimony given by the different witnesses. (3) *The simplicity and apparent truthfulness* with which the witnesses describe their impressions when the Saviour appeared to them. (4) That *the event borne witness to was completely unexpected by the witnesses.* Various attempts have been made to explain away the resurrection of Christ. There is the supposition (1) of fraud; that, according to the statement of the Jews, the disciples stole the body, and then published the story that their Lord was risen. (2) That Jesus had not really died on the cross; that his apparent death was only a swoon, from which he afterwards recovered. (3) That there had been no real resurrection, but that the disciples had been deceived by visionary appearances or hallucinations. (4) That the assertion of the resurrection was originally allegorical. With regard to the significance of the resurrection of Christ, it was (believers assert) the crowning evidence of the divine character of his mission, he himself had spoken of it as what should be the most convincing proof to the world that he really was what he professed himself to be; and in this light it was constantly appealed to by the apostles in addressing the world.

Resurrection, Congregation of the, a society of Roman Catholic priests founded at Rome in 1836.

Resuscitation. See *Drowning.*

Retainer (re-tān'ėr), in law, the act of a client by which he engages an attorney or counselor to manage a case. The effect of a retainer is to confer on the attorney all the powers exercised by the forms and usages of the court in which the suit is pending. It is *special* when given for the purpose of securing the counsel's services for a particular case; *general*, when for securing his services generally. The retainer is in all cases accompanied by a preliminary fee called a retaining fee.

Retaining Wall, a wall erected for the purpose of confining a body of water in a reservoir, or for resisting the thrust of the ground behind it. As a general rule the thickness of retaining walls is one-third their height; in reservoir and dock walls of masonry the thickness is about one-half their height.

Retardation (rē-tar-dā'shun), in physics, the diminution of the velocity of a body from the friction of the medium in which the body moves or from the attraction of gravity. The laws of retardation are the converse of those of acceleration.

Rete Mucosum (rē'tē mū-kō'sum), in anatomy, the deepest layer of the epidermis or scarf-skin, resting on the cutis vera or true skin. It is the seat of the color of the skin and in the negro contains black pigment.

Retention (re-ten'shun), in law, a lien; the right of withholding a debt or of retaining property until a debt due to the person claiming this right is duly paid.

Retention of Urine, in medicine, a condition in which the urine cannot be expelled from the bladder at all, or only with great difficulty; to be distinguished from suppression of urine, a condition in which the bladder is empty, the urine not having been secreted by the kidneys. It may be due to some mechanical obstruction, as a calculus, a clot of blood, or a tumor, or to paralysis, etc. If not relieved by means of the catheter or otherwise it may cause rupture of the bladder and death.

Retford (ret'ford), East, a municipal borough in Nottinghamshire, England, 32 miles E. N. E. of Nottingham, on the Idle, here crossed by a bridge connecting East Retford with West Retford. It has foundries, machine-shops, paper and corn mills, etc. Pop. 13,336.

Rethel (ret-el), a town of France, department of Ardennes, on the Aisne, 23 miles N. E. of Rheims, with manufactures of merinos and cashmeres. Pop. (1906) 5254.

Rethel (rā'tel), Alfred, a German historical painter, born at Aix-la-Chapelle in 1816; studied at Düsseldorf (under Schadow), Frankfort (under Veit and Schwind), and Rome. He died at Düsseldorf in 1859. His greatest works are four frescoes in the town-house of Aix-la-Chapelle representing incidents connected with the life of Charlemagne, other four there being executed from his designs after his death. These are among the finest modern works of the kind. German history and the Bible also furnished him with various subjects, and he painted in water-color a series of pictures illustrative of Hannibal's passage of the Alps.

Retiarius (rē-shi-ā'ri-us), in Roman antiquities, a gladiator who wore only a short tunic and carried a trident and net, with which he endeavored to entangle and despatch his adversary, who was armed with helmet, shield, and sword.

Reticulated Molding (re-tik'ū-lāted), in architecture, a member enriched with a raised fillet interlaced in various ways like network. It is seen chiefly in buildings in the Norman style.

Reticulated Work, a species of masonry very common among the ancients, in which the stones are square and laid lozenge-

Reticulated Work — Roman.

wise, resembling the meshes of a net, and producing quite an ornamental appearance. It is the *opus reticulatum* of the Romans.

Reticulum (re-tik'ū-lum), the honeycomb bag or second cavity of the complex stomach of ruminants.

Retina (ret'i-na), in anatomy, a membrane of the eye, formed by an expansion of the optic nerve, and so constituted as to receive and transmit to the nerve the impressions which result in vision. See *Eye.*

Retinite (ret'i-nīt), a fossil resin found in the lignite beds of Devonshire, Hanover, and elsewhere.

Retirement (re-tīr'ment), in the army and navy, is withdrawment from the service with the retention of all or a portion of the pay. In the British army and navy the retirement of officers may be voluntary, but all officers must retire at fixed ages, according to their rank, receiving corresponding retired pay. In the United States army and navy officers are retired after forty years' service, or at sixty-two years of age, as the case may be, or at any time for sickness or disablement, receiving 75 per cent. of their annual pay for life.

Retort (re-tort'), a vessel, generally of glass, used in chemistry for distilling liquids. Retorts consist of flask-shaped vessels to which long necks or beaks are attached. The liquid to be distilled is placed in the flask and heat applied. The products of distillation condense in the cold neck of the retort, and are collected in a suitable receiver. In gasmaking, retorts of iron or fire-clay are used for distilling the coal.

Retreat (re-trēt'), a military operation, in which an army retires before an enemy; properly, an orderly march, in which circumstance it differs from a flight. Also a military signal given in the army by beat of drum or sound of trumpet at sunset, or for retiring from exercise or from action.

Retriever Dog (re-trēv'er), a dog specially trained to seek and fetch game which has been shot, and greatly valued by sportsmen for its sagacity in the field and in the water. The larger and more familiar breed of retrievers is formed by crossing the Newfoundland and setter; the smaller breed is formed by crossing the water-spaniel and terrier. The typical retriever is 20 or more inches high, with a stoutly-built body, strong limbs, webbed toes, and black and curly fur.

Retrograde (ret'rō-grād), a term given to the apparent motion of a planet among the stars when it is in opposition to the motion of the sun in the ecliptic. The motion of a planet in the direction from right to left is said to be *direct.*

Retrogression of the Moon's Nodes (ret'rō-gresh-un), the motion of the moon's nodes — the two points in which the moon's orbit meets the plane of the ecliptic — in the direction opposite to that of the sun's motion in the ecliptic. The moon's nodes slowly change at each revolution of the moon, in the direction from left to right, and make a complete revolution round the earth in 18.6 years.

Return (re-turn'), in law, the sending back of a writ or other process to the court from which it issued by the officer to whom it was addressed, with a written account of what he has done in executing the process, to be filed for reference in the office of the clerk of the court.

Returning Officer, the presiding officer who conducts an election and who returns the persons duly elected. He is styled the judge of election, he and the inspectors signing the certificate of election.

Retz, GILLES DE. See *Rais.*

Retz (rā), JEAN FRANÇOIS PAUL DE GONDI, CARDINAL DE, was born at Montmirail in 1614; died at Paris, 1679. Contrary to his own inclinations, he was designed by his father, who was general of the galleys, for the church. His instructor was the celebrated Vincent de Paul. As a young abbé he led a very improper life, but his brilliant gifts, his eloquence, his audacity, and his great connections nevertheless enabled him to advance in his ecclesiastical career. In 1643 he received a doctorate at the Sorbonne, and was appointed coadjutor of his uncle, the Archbishop of Paris. He was the implacable enemy of Mazarin, and in 1648 became the most energetic and unscrupulous of the leaders of the Fronde. On the fall of Mazarin he was selected as minister by the queen-regent, Anne of Austria, and in 1651 received the cardinal's hat; but on Mazarin's return to power in 1652 he was arrested and imprisoned, first at Vincennes, then at Nantes. He escaped, however, after two years' captivity, and for nearly eight years wandered through Spain, Italy, Holland, Germany, and England. After the death of Mazarin in 1661 he was allowed to return to France, on condition that he should resign his claims to the archbishopric of Paris, receiving instead the rich abbey of St. Denis. During the last seventeen years of his life he lived retired, paid his immense debts, and occupied himself with the composition of his *Mémoires*, which are inimitable for their historic truth and narrative skill.

Retzsch (rech), MORITZ, a German artist, was born at Dresden in 1779; died there in 1857. He studied at the art academy of his native city, of which he was appointed a professor in 1824. His most celebrated works are his outline illustrations of Shakespere, Goethe, Schiller, Fouqué, and others.

Reuchlin (roi*h*'lĭn), JOHANN, a German scholar, born in 1455 at Pforzheim; died in 1622. He studied at Freiburg, the University of Paris, Bâle, and elsewhere, and became familiar with Latin, Greek, and Hebrew. He was patronized by several of the German princes, and was engaged on various political missions. From 1502 to 1513 he was president of the Swabian federal court. His opposition to the proposal to burn all Hebrew books except the Bible raised a host of fanatical enemies against him, but did him no harm. In 1519 he was appointed professor at Ingolstadt; in 1521 the plague drove him to Stuttgart. During a great part of his life Reuchlin was the real center of all Greek and Hebrew teaching in Germany. Several of his works had considerable popularity in their time. He sympathized deeply with Luther in the earlier stage, but maintained his connection with the Roman Catholic Church to the last.

Reumont (roi'mont), ALFRED VON, a German historian, born at Aix-la-Chapelle, in 1808, was educated at Bonn and Heidelberg, and entered the Prussian diplomatic service, filling posts at Florence, Constantinople, and Rome. From 1851 till 1860, when he retired into private life, he was successively Prussian minister at Florence. Modena, and Parma. He died in 1887. He was the author of several valuable works on the history of Italy, including *Contributions to Italian History*, *The Carafas of Maddaloni*, *History of the City of Rome*, etc. He also wrote on the history of art.

Réunion (rā-ū-ni-ōn), formerly BOURBON, an island in the Indian Ocean, between Mauritius and Madagascar, 115 miles from each; area, 1127 square miles. It was annexed by France in 1643, and is an important French colony, now sending a representative to the chamber of deputies, and forming practically almost a department of France. It is very mountainous, the Piton des Neiges reaching a height of 10,069 feet, and the Piton de la Fournaise, an active volcano, of 8294 feet. The soil produces tropical products, sugar being the principal crop. Coffee, cloves, and vanilla are also grown. Destructive hurricanes are frequent. There are no natural harbors, but an artificial harbor has been constructed at Pointe des Galets, at the northwest side of the island; and this harbor is connected by railway with St. Denis (the capital), and all the principal places on the coast. The population, which consists of creoles, negroes, Indian coolies, Chinese, Malays, etc., is 173,315.

Reus (rā'ös), a city of Spain, in Catalonia, in the province and 10 miles west of Tarragona, in a plain at the base of a chain of hills, about 4 miles from the port of Salou on the Mediterranean. Reus is now, next to Barcelona, the most flourishing manufacturing town of Catalonia, the staples being silk and cotton. Imitation French wines are largely made. Pop. 26,681.

Reuss (rois), two principalities of Central Germany, consisting of several separate territories situated between Prussia, Saxony, and Bavaria, and belonging to an older and younger line of the family of Reuss. Reuss-Greiz, the territory of the elder line, comprises an area of 122 square miles, with a pop. of 70,603; the territory of the younger line,

Reuss-Schleiz-Gera, has an area of 319 square miles, with a pop. of 144,584. Both principalities have been members of the German Empire since 1871, each sending one member to the federal council and one representative to the Reichstag.

Reuter (roi'tėr), FRITZ, a German humorist, was born in 1810, and educated at Rostock and Jena. He became an active member of the student society 'Germania,' which cost him seven years' imprisonment in Prussian fortresses. Returning home in 1840 he supported himself first by farming, then by teaching, and finally by literary work. His first literary venture was a volume of humorous poems in Low German (*Laüschen and Riemels*, 1853), which met with extraordinary success. His greatest work is *Olle Kamellen*, a series of prose tales, which stamped him as the greatest writer of Plattdeutsch and one of the greatest humorists of the century. He died at Eisenach in 1874.

Reuter (roi'tėr), PAUL JULIUS, BARON, born at Cassel in 1821, was connected with the electric telegraph system from the beginning, and in 1849 established Reuter's News Agency at Aix-la-Chapelle. In 1851, on the laying of the cable between Calais and Dover, he transferred his chief office to London, and became a naturalized Englishman. As the telegraphic system extended he increased his staff of agents, until the newspaper press, the foreign bourses, and all banking, shipping, and trading companies became dependent in a great measure on Reuter's Agency for the latest information from all parts of the world. In 1865 he converted his agency into a limited liability company, of which he was managing director until 1878. In 1871 he received the title of baron from the Duke of Coburg-Gotha. He has laid down several important telegraphic cables. Died Feb. 25, 1899.

Reutlingen (roit'ling-ėn), a town of Würtemberg, 20 miles south of Stuttgart; has manufactures of cottons, woolens, lace, leather, etc. It is of considerable antiquity, and long maintained the rank of a free imperial city. It was incorporated with Würtemberg in 1802. Pop. 23,850.

Reval, or REVEL (re-vel'), a fortified seaport of Russia, capital of Esthonia, on a small bay in the Gulf of Finland. It consists of two parts, the old or upper town, surrounded by walls and situated on a rocky height, and the lower town on the beach. Reval was an important seaport of the Hanseatic League, and came into the possession of Russia in 1710. Its trade is chiefly in grain, flax, beer, animals and machinery. The construction of a naval harbor was begun in 1912, and it was the base of the Russian Baltic fleet. The port was captured by German forces in 1918 during the European war. The population in 1910 was 98,995, of whom one-fourth were Germans.

Reveillé (re-vel'yā, from French, *reveiller*, to awaken), the signal given in garrisons at break of day, by beat of drum or sound of bugle, for the soldiers to rise and the sentinels to forbear challenging until the retreat is sounded in the evening.

Revelation (rev-e-lā'shun), the knowledge of God and his relation to the world, claimed to be given to men by God himself, and for the Christian contained in the Bible. The earliest revelations, made in the patriarchal age, were preserved till later times, and gradually enlarged during the Mosaic period by successive revelations to chosen individuals, with whom the Bible makes us acquainted under the name of prophets, from Moses to Malachi, the revelations finally completed being through Christ. See *Christianity*.

Revelation, BOOK OF. See *Apocalypse*.

Revelganj (rev-el-ganj'), or GODNA, a commercial town of India, in Bengal, near the junction of the Ganges and Ghagra. It has an important local trade. Pop. about 15,000.

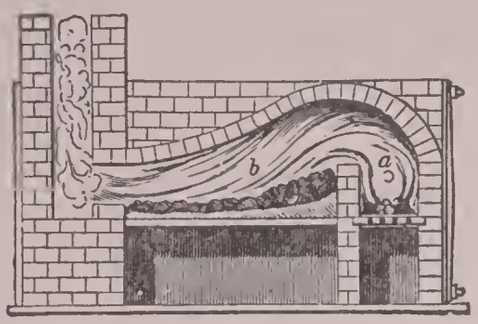
Revels (rev'elz), MASTER OF THE, an officer formerly appointed in England to superintend the revels or amusements, consisting of dancing, masking, etc., in the courts of princes, the inns of court, and noblemen's houses, during the twelve Christmas holidays. He was a court official from the time of Henry VIII to that of George III.

Revenue (rev'e-nū), the income of a nation derived from taxes, duties, and other sources, for public uses. See articles on the different countries, also *Tax*, etc.

Revenue Cutter, a sharp-built single-masted vessel, armed for the purpose of preventing smuggling and enforcing the custom-house regulations.

Reverberatory Furnace (re-ver'ber-a-tu-ri), a furnace in which the material is heated without coming into contact with the fuel. Between the fireplace *a* and the bed on which the material to be heated *b* lies, a low partition wall, called a fire-bridge, is placed. The flame passes over this bridge, and

plays along the flat arch which surmounts the whole, reflecting or reverberating the heat downwards. The reverberatory furnace gives free access of air to the material, and is employed for oxidizing impurities in metals, and for other similar purposes.



Section of Reverberatory Furnace.

Revere (re-vēr'), PAUL, was born at Boston, Massachusetts, Jan. 1, 1735, was one of the earliest American engravers and an active patriot in the Revolution. He was one of those who destroyed the tea in Boston harbor, and he earned fame by riding from Charlestown towards Concord on the night of April 18, 1775, to give warning of the British expedition, which was resisted next day at Lexington and Concord; a service immortalized in Longfellow's poem, *The Midnight Ride of Paul Revere.* During the war he rose to be lieutenant-colonel of artillery. In 1801 he erected works for rolling copper at Canton, Massachusetts, still carried on by his successors. He died May 10, 1818.

Revere, a city of Suffolk Co., Mass., adjoining Boston, on the coast. Revere Beach is a noted resort. Pop. (1920) 28,823.

Reverend (rev'er-end), a title of respect given to clergymen and other ecclesiastics. In England bishops are *right reverend*, archbishops *most reverend*, deans *very reverend*, and the lower clergy *reverend.* In Scotland the principals of the universities, if clergymen, are *very reverend*, and likewise the moderator of the General Assembly; all the other clergy *reverend*, as also in the United States.

Reverse (re-vers'), in numismatics, the side of a medal or coin opposite to that on which the head or principal figure is impressed. The latter is called the *obverse.*

Reversion (re-ver'shun), in law, the residue of an estate left in the granter, to commence in possession after the determination of the particular estate granted by him. The estate returns to the granter or his heirs after the grant is over. In insurance business a reversion is an annuity or other benefit, the enjoyment of which begins after a certain number of years, or after some specified event, as a death or birth.

Revetment (re-vet'ment; French, *revêtement*), in fortification, is a retaining wall placed against the sides of a rampart or ditch. In field-works it may be of turf, timber, hurdles, and the like; but in permanent works it is usually of stone or brick. The exterior faces of these walls are considered as the scarp and counterscarp of the ditch.

Review (re-vū), an inspection of military or naval forces by an officer of high rank or by a distinguished personage, which may be accompanied with maneuvers and evolutions.

Reviews. See *Periodicals.*

Revise (re-vīz'), among printers, a second or third proof of a sheet to be printed, taken off in order to be compared with the last proof, to see that all the mistakes marked in it have been corrected. See *Proof Impression.*

Revising Barrister, in England, one of a number of barristers appointed annually for the purpose of examining or revising the list of parliamentary voters, and settling the question of their qualification to vote — duties performed in Scotland by the sheriff-substitute. The revising barristers' courts are held in the autumn.

Revival (re-vī'val), a term applied to religious awakenings in the Christian church, and to the occurrence of extensive spiritual quickening and conversion in the general community. The first great revival in Europe was the Reformation in the sixteenth century, which awoke the church from the sleep of centuries. When religion had degenerated into formalism in England in the seventeenth century a second revival of spiritual interest was accomplished through the instrumentality of the Puritans. When the church had once more sunk into a state of sloth and apathy in the eighteenth century, it was aroused by the preaching of Whitfield, the Wesleys, Rowland Hill, and other earnest men. Coincident with this movement was the origin of missions to the heathen. But it was reserved for recent times to witness in the United States and Great Britain perhaps the most remarkable religious revival which has been witnessed since the era of the Reformation. Movements of this nature, but of limited extent, have not been infrequent in the American churches, as in 1736 and 1830; but the great revival which originated in

the United States in 1858 subsequently extended to the British Islands, and was experienced with more or less power throughout almost every part of the world. New York and Philadelphia were the principal centers of the movement, which became universal in the United States, embracing all denominations and all classes of society. In the summer of 1859 the revival extended to the north of Ireland, chiefly through the agency of the Presbyterian Church, and from there to Scotland, Wales and various parts of England. A later revival movement was that initiated by the two American 'evangelists,' D. L. Moody and Ira D. Sankey, the latter a singer, whose hymns aided Moody's sermons in arousing religious feeling. The movement commenced in 1873 in England, but it attained no great prominence until the arrival of the two evangelists in Edinburgh. Their ministrations in that city, and afterwards in Glasgow, Dundee, and other towns in Scotland, and also in England and Ireland, up to August, 1875, were attended daily by multitudes of people, a remarkable feature of these assemblies being the presence in great numbers of the upper ranks of society, even to members of the peerage and royal family. On their return to the United States they headed a similar movement there; and they paid a second and equally successful visit to Britain in 1883-84. The Salvation Army, which was originated in 1865 and organized under its present name in 1878, may be regarded as a permanent revival organization. See *Salvation Army*. In 1896 'Billy' Sunday (see *Sunday*) began a series of remarkable revivals in various cities of the United States, and after the campaign in Philadelphia in 1915 his converts were reported to number about 300,000. His sermons, in racy, colloquial English, carried a very strong popular appeal; and his campaigns were notable for their careful business organization. He required an appeal from the churches of a city before undertaking a revival, and their active co-operation during the campaign period.

Revival of Learning. See *Renaissance.*

Revolution (rev-u-lū'shun), the more or less sudden, and it may be violent, overturning of a government or political system, with the substitution of something else. The term 'revolution' is applied distinctively in English history to the convulsion by which James II was driven from the throne in 1688; in American history to the war of independence of 1775-83; in French history to the upheaval of 1789; and in Chinese history to the overturning of the government in 1911. Subsequent French revolutions were those of 1830, 1848, and 1871.

Revolutionary War. See *United States.*

Revolver (re-vol'vėr), a variety of firearm in which a number of charges contained in a revolving cylinder are, by pulling the trigger, brought successively into position and fired through a single barrel. For the introduction of the revolver in its present form we are indebted to Colonel Samuel Colt, of the United States, though repeating pistols had long been known in other countries. These were made from one mass of metal bored into the requisite number of barrels, but were so clumsy as to be almost useless. In Colt's weapon there is a revolving cylinder containing six chambers placed at the base of the barrel, each chamber having at its rear end a nipple for a cap. These contain the cartridges, which are put in from the front of the breech-piece and driven home by a lever ramrod placed in a socket beneath the barrel. The revolver is fired through the single barrel, the cylinder being turned by mechanism connected with the lock, until each chamber in succession is brought round so as to form virtually a continuation of the barrel. Various modifications of Colt's revolver have been introduced, with the view in some cases of increasing the rapidity and facility of firing, in others of diminishing by safeguards the risks to which inexperienced hands must ever be exposed in the use of these weapons. In the Smith and Wesson revolver, one of the most recent (adopted by Austria and Russia), facility in loading is a feature, the cylinder and barrel together being pivoted to the front of the stock, so that by setting the hammer at half-cock, raising a spring-catch, and lowering the muzzle, the bottom of the cylinder is turned up to receive fresh metallic cartridges. When this is done the muzzle is pressed back until the snap-catch fastens it to the back plate, and the revolver is again ready to be fired. In the latest form of this revolver the spent cartridges are thrown out of the cylinder by means of an automatic discharger. Several other forms of the revolver are in use, their principal features being means to facilitate loading and firing. The revolver principle has also been applied to rifles, and to guns for throwing small projectiles as in the Gatling and other machine guns

Revolving Furnace, a furnace with a rotary motion, used in some chemical manufactures of malleable iron. The revolving furnace has superseded the reverberatory furnace in many processes.

Revolving Light. See *Lighthouse.*

Rewá (rā'wä), a native state in Central India, more or less under British control since 1812. Area, about 10,000 square miles; pop. (chiefly Hindus) about 2,000,000. The state is rich in minerals and forest produce.— The town of Rewá lies 75 miles S. W. of Allahabad; it is surrounded by three ramparts, the innermost of which encloses the palace of the maharaja. Pop. about 25,000.

Rewá Kántha (kän'tu), a political agency of India, subordinate to the government of Bombay. It was established in 1821-26, and has under its control 61 separate states, great and small, on the Nerbudda, most of which are tributary to the Gaekwar of Baroda. Area, 4792 square miles; pop. 479,065.

Rewári (rē-wä rē'), a town in India, in Gurgaon district, Punjab, a place of considerable commercial importance, with manufactures of brass and pewter vessels and fine turbans, and a great trade in grain. Pop. 27,295.

Reyjkavik (rik'yä-vēk), a town, capital of Iceland. Pop. 8000.

Reynard the Fox. See *Renard.*

Reynolds (ren'oldz), John Fulton, a soldier, was born at Lancaster, Pennsylvania, in 1820, was graduated from West Point in 1841, served in the Mexican war, and in 1859 became commandant at West Point. He entered the Civil war in 1861 as lieutenant colonel of volunteers, was soon promoted brigadier general, and major-general in 1862, succeeding Hooker in command of the first army corps. He commanded in the first day's fight at Gettysburg, July 1, 1863, and was killed on the field.

Reynolds, Sir Joshua, an English portrait-painter, was born at Plympton, Devonshire, July 16, 1723, and was educated by his father, a clergyman and the master of the free grammar school of that place. He studied his art for two years under Thomas Hudson, a Devonshire man then popular in London as a portrait-painter. Subsequently, through the kindness of Captain (afterwards Admiral) Keppel, he was enabled to visit Italy, where he studied three years. Returning to London in 1753, and finding generous patrons in Admiral Keppel and Lord Edgcumbe, his studio was thronged with the wealth and fashion of the metropolis, and the most famous men and the fairest women of the time were among his sitters, so that he rapidly acquired opulence, and was the acknowledged head of his profession. Among the more notable of his portraits are the *Duchess of Hamilton* (1758), the *Duke of Cumberland* (1759). *Miss Palmer* (1770), *Mrs. Nesbitt as Circe* (1781), *Mrs. Siddons as the Tragic Muse* (1784), the *Duchess of Devonshire and Child* (1786), and *Miss Gwatkin as Simplicity* (1788). In 1768, on the foundation of the Royal Academy, he was chosen president, and received the honor of knighthood; and in 1784 he was appointed principal portrait-painter to the king. As president of the Royal Academy he delivered his celebrated annual *Discourses on Painting*, the last of which was delivered in 1790. He was the intimate friend of Dr. Johnson, Goldsmith, Garrick, Burke, and other literary celebrities, with whom he was associated in founding the 'Literary Club' in 1764. His portraits are distinguished by dignity and grace, and above all by a peculiar power of color which he had caught in Italy from the great Venetian masters. Apart from portraiture the other pictures which may be mentioned are his *Death of Cardinal Beaufort*, *Macbeth*, *Puck*, and several *Holy Families* and *Nativities*. He died unmarried Feb. 23, 1792, and was interred in St. Paul's Cathedral.

Sir Joshua Reynolds.

Rhabdomancy (rab'du-man-si; Greek *rhabdos*, a rod, and *manteia*, divination), divination by means of the divining-rod (q. v.).

Photo from Wm. H. Rau

THE CATHEDRAL AT RHEIMS

The western front, showing the famous rose window and the many statues which guard the door. This edifice, one of the finest Gothic structures in Europe, suffered severely in the European War, the roof and many of its exquisite windows being destroyed.

Rhadamanthus (rad-a-man'thus), in Greek mythology, a son of Zeus and Europa, and brother of Minos, king of Crete, whom he assisted in his sovereignty, and whose jealousy he aroused by his inflexible integrity, which earned for him the admiration of the Cretans. Rhadamanthus then fled to Bœotia, where he married Alcmene. After his death he became, on account of his supreme justice, one of the three judges of the lower world.

Rhætia (rē'she-a), a province of the Roman Empire, which included great part of the Alpine regions between the valleys of the Danube and the Po, and corresponded with the districts occupied in modern times by the Austrian province of Tyròl and the Swiss canton of Grisons. The Rhætians, who are generally supposed to have been of Etruscan origin, were subdued by Drusus and Tiberius, 15 B.C., and shortly afterwards Rhætia was incorporated as a province in the Roman Empire. During the last days of the Roman Empire, when the barbarians devastated the provinces, Rhætia was nearly depopulated; and after the fall of the Roman Empire it was occupied by the Alemanni and Suevi.

Rhætian Alps. See *Alps.*

Rhætic Beds (rē'tik), in geology, the uppermost strata of the triassic, or, according to others, the lowest of the liassic group; well represented in England and Germany, but most extensively developed in the Rhætian Alps, whence their name. They are more highly fossiliferous than any of the other members of the triassic period.

Rhamazan. See *Ramadan.*

Rhamnaceæ (ram-nā'se-ē), a natural order of exogenous plants, consisting of trees or shrubs, with simple, alternate, rarely opposite leaves, small greenish-yellow flowers, a valvate calyx, hooded petals, opposite to which their stamens are inserted, and a fruit which is either dry or fleshy. This order contains about 250 known species, distributed very generally over the globe. There is a remarkable agreement throughout the order between the properties of the inner bark and the fruit, especially in several species of *Rhamnus*, in which they are both purgative and emetic, and in some degree astringent. Many species, however, bear wholesome fruit; and the berries of most of them are used for dyes. (See *French Berries.*) The buckthorn and jujube belong to this order.

Rhapsodists (rap'su-dist; from the Greek *rhaptō*, to string together, and *ōdē*, a song), were the wandering minstrels among the ancient Greeks, who sang poems of Homer (these were also called *Homeridæ*) and of other poets. After the poems were committed to writing the rhapsodists lost their importance.

Rhé. See *Ré.*

Rhea (rē'a), in Greek mythology, the daughter of Uranos and Gē (Heaven and Earth), sister and wife of Cronos (Saturn), and mother of Hestia (Vesta), Dēmētēr (Ceres), Hera (Juno), Hades (Pluto), Poseidon (Neptune), and Zeus (Jupiter). She was the symbol of the reproductive power of nature and received the appellation of 'Mother of the Gods,' and 'Great Mother,' being later identified with Cybele.

Rhea, same as *Ramie* or *Ramee* (which see).

Rhea, the generic name of the nandu, or South American ostrich, a close ally to the true ostrich, differing chiefly in having three-toed feet and each toe armed with a claw. The best-known species is *R. Americana*, the *nandu*, or *nanduguaçu* of the Brazilians, inhabiting the great South American pampas. It is considerably smaller than the true ostrich, and its plumage is much inferior. *R. Darwinii*, a native of Patagonia, is still smaller. A third species is the *R. macrorhyncha*, so-called from its long bill.

Rhegium. See *Reggio.*

Rheims, or REIMS (rēmz; French pron. raṇz), a town of France, in the department of Marne, in an extensive basin surrounded by vine-clad hills, 82 miles E. N. E. of Paris. The principal edifices are the cathedral, erected in the thirteenth and fourteenth centuries, one of the finest Gothic structures now existing in Europe, specially remarkable for its western façade with three portals, rose-window, and numerous statues; the archiepiscopal palace (1498–1509), occupied by the French kings on the occasion of their coronation; the church of St. Remy (eleventh and twelfth centuries), the oldest church in Rheims, partly Romanesque, partly Gothic; the Porte de Mars, a Roman triumphal arch erected in honor of Julius Cæsar and Augustus; the town-house, of the seventeenth century; and several ancient mansions, particularly the hôtel of the counts of Champagne, furnishing fine specimens of picturesque street architecture. The staple industries are the manufacture of the wine known as champagne, and of woolen fabrics, such as flannels, merinos, blankets, etc. Rheims was an

important place in the time of Cæsar, the capital of the Remi, and subsequently of Belgic Gaul. Here St. Remy converted and baptized Clovis and almost all the Frankish chiefs in 496. It was made the seat of an archbishop in the eighth century, and from the time of Philip Augustus (1179) to that of Charles X the kings of France were crowned here. It has suffered much from war, and was at one time in possession of the English, who were expelled by the Maid of Orleans in 1429. It was held by the Germans in 1870-71. During the European war it was bombarded again and again by the Germans, and was the target for many aerial raids, the greater part of the city being reduced to ashes. The famous cathedral suffered irreparable damage; the interior was ruined and the roof and many of the beautiful windows were destroyed. Population in 1911, 115,178.

Rhenish Prussia (ren'ish prush'a; German, *Rheinprovinz*), the most westerly province of Prussia, touching W. and N. Luxemburg, Belgium, and Holland; area, 10,420 square miles; greatest length from N. to S. about 200 miles, greatest breadth about 90. In the south it is hilly, being traversed by the ranges of the Eiffel, Hochwald, etc. It is watered by the Rhine, the Moselle, and some affluents of the Meuse. A large proportion of the surface is in forest. Besides the usual cereal crops, tobacco, hops, flax, rape, hemp, and beet-root are raised; fruit culture and the vine culture are also carefully attended to. Cattle are extensively reared. It is the most important mineral district in Germany, abounding in coal, iron, lead, zinc, etc. It is likewise an active manufacturing district, there being numerous ironworks and machine-shops, textile factories, breweries, distilleries, etc. It is divided into the five governments or districts of Coblentz, Treves, Cologne, Aachen (Aix-la-Chapelle), and Düsseldorf. The city of Coblentz is the official capital of the province, but Cologne is the town of most importance. Pop. 5,759,798, the majority of whom are Roman Catholics.

Rhenish Wines, the general designation for the wines produced in the region watered by the Rhine, and specifically for those of the Rheingau, the white wines of which are the finest in the world. The red wines are not so much esteemed, being considered inferior to those of Bordeaux. Good wines are also produced in the valleys of the Neckar, Moselle, and other tributaries of the Rhine. The vineyards are mainly between Mannheim and Bonn, and the most valuable brands of wines are those of Johannisberg, Steinberg, Hochheim, Rüdesheim, Rauenthal, Markobrunn, and Assmannshausen, the last being a red wine.

Rheostat (rē'u-stat), an instrument for measuring electrical resistances, invented by Sir Charles Wheatstone. The rheostat is very convenient for measuring small resistances; but for practical purposes, such as measuring the resistance of telegraph cables, Wheatstone's bridge (an apparatus of which there are several forms) is always used.

Rhesus Monkey (rē'sus), a name for two species of monkeys, the brush or pig-tailed monkey (*Macācus nemestrīnus*), which inhabits the Malay Peninsula and the islands of the Indian Archipelago, and is often domesticated; and the *Macacus Rhesus*, a species of monkey held sacred in India, where they swarm in large numbers about the temples.

Rhetoric (ret'o-rik), in its widest sense, may be regarded as the theory of eloquence, whether spoken or written, and treats of the general rules of prose style, in view of the end to be served by the composition. In a narrower sense rhetoric is the art of persuasive speaking, or the art of the orator, which teaches the composition and delivery of discourses intended to move the feelings or sway the will of others. In the wider sense rhetoric treats of prose composition in general, purity of style, structure of sentences, figures of speech, etc.; in short, of whatever relates to clearness, preciseness, elegance, and strength of expression. In the narrower sense it treats of the invention and disposition of the matter, the character of the style, the delivery or pronunciation, etc. Aristotle, Cicero, and Quintilian are the principal writers on rhetoric among the ancients. Those of modern times are numerous.

Rheumatism (rö'mâ-tizm) is a systemic disease that affects the muscles, joints, and heart. It occurs in acute, chronic, and muscular forms. The acute form is characterized by heat, inflammation, serous effusion, and excruciating pain in the joints, increased by movement; fever, profuse acid sweats, great thirst, constipation, redness of the skin over the joints, and a condition of the skin akin to prickly heat. It suddenly ceases in some joints and immediately begins in others. It lasts from two to six weeks or even longer. The chronic form is marked by pain and stiffness in the joints or muscles, aggravated by stormy weather. It may become acute on slight provocation. Unless

thoroughly eradicated it may seriously impair the joints. The muscular form may affect almost any of the muscles. That of the muscles of the back, lumbago, is a well-known and frequent condition. Rheumatism is caused by chilling of the body by a cold and moist atmosphere, especially when following in succession to a warm one, such as occurs in spring or autumn, though it may occur at any season of the year. Acute cases or those of long duration may have involvement of the heart as a consequence. A large percentage of heart diseases are caused by rheumatism, which ought never to be neglected. There seems to be a relation among rheumatism, St. Vitus' dance and tonsilitis. It is treated by rest in bed, heat, use of woolen bedclothes and clothing (to avoid chilling by linen and cotton), alkaline drinks and appropriate medication adapted to the particular case. Advertised rheumatic remedies are dangerous, as each case must be treated on its merits. After the subsidence of the acute condition, massage and passive and active movements, judiciously attempted, accelerate recovery.

Rheydt (rīt), a town of Rhenish Prussia, on the Niers, 14 miles W. of Düsseldorf, has manufactures of cotton, silk, woolen, and mixed fabrics. Rheydt is an ancient place, which has risen to industrial importance during the last century. Pop. (1910) 43,786.

Rhigas (rē'gas), CONSTANTINE, a Greek poet, the Tyrtæus of modern Greece, the first mover of the war for Grecian independence, was born about 1753. He formed the bold plan of freeing Greece from the Porte by means of a great secret association, and composed in his native language a number of patriotic songs, calculated to inflame the imagination of the Greek youth and to embitter them against the Mussulmans. He was arrested and put to death by the Turkish authorities at Belgrade in May, 1798. During the Greek war of independence, his songs were in the mouth of every one.

Rhin (rēn), BAS- and HAUT-, that is Lower and Upper Rhine, departments of France, on the west of the Rhine, embracing the former German territory of Alsace-Lorraine (q. v.).

Rhinanthus (ri-nan'thus), a genus of annual herbs, natural order Scrophulariaceæ, with opposite, serrate leaves and nodding spikes of yellow flowers. The species are parasitic on the roots of plants. Two of them grow in pastures in the United States, and are known as *yellow rattle.*

Rhinelander (rīn'lan-dėr), county seat of Oneida Co., Wisconsin, on Wisconsin River, with good water power. Its industries include refrigerators, paper, and lumber. Pop. 6654.

Rhine (rīn; German, *Rhein;* Dutch, *Rijn*), the largest river of Germany, and one of the most important rivers of Europe, its direct course being 460 miles and its indirect course 800 miles (about 250 miles of its course being in Switzerland, 450 in Germany, and 100 in Holland); while the area of its basin is 75,000 square miles. It is formed in the Swiss canton Grisons by two main streams called the Vorder and Hinter Rhein. The Vorder Rhein rises in the Lake of Toma, on the S. E. slope of the St. Gothard, at a height of 7690 feet above the sea, near the source of the Rhone, and at Reichenau unites with the Hinter Rhein, which issues from the Rheinwald Glacier, 7270 feet above sea-level. Beyond Reichenau, which is 7 miles west of Coire, the united streams take the common name of Rhine. From Coire the Rhine flows north through the Lake of Constance to the town of that name, between which and Bâle it flows west, forming the boundary between Switzerland and Germany. At Bâle it turns once more to the north and enters Germany; and, generally speaking, it pursues a northerly course until it enters Holland, below Emmerich, when it divides into a number of separate branches, forming a great delta, diked on both sides, and falling into the sea by many mouths, through sluice gates. The chief of these branches are the Waal and Lek, which unite with the Maas; the Yssel and Vecht, which diverge to the Zuyder Zee; and that which retains the name of Rhine, a small stream that passes Leyden and enters the North Sea. In the German part of its course the chief tributaries it receives on the left are the Ill, Nahe, Moselle (with the Saar), Ahr, and Erft; and on the right the Neckar, Main, Lahn, Sieg, Ruhr, and Lippe. In Switzerland its tributaries are short and unimportant, and this part of its course is marked by the Falls of the Rhine at Schaffhausen, where the river is precipitated in three leaps over a ledge of rocks 48 to 60 feet in height, and by the cataracts of Lauterberg and the rapids of Rheinfelden. The chief towns on its banks are Constance and Bâle in Switzerland; Spires, Mannheim, Mainz, Coblentz, Bonn, Cologne, and Düsseldorf, with Worms and Strasburg not far distant, in Germany; Arnheim, Utrecht, and Leyden, in Holland. Its breadth at Bâle

is 750 feet; between Strasburg and Spires from 1000 to 1200 feet; at Mainz 1500 to 1700 feet; and at Emmerich, where it enters the Netherlands, 2150 feet. Its depth varies from 5 to 28 feet, and at Düsseldorf amounts even to 50 feet. It abounds with fish, especially pike, carp, and other white fish, but the produce of its salmon fisheries have been seriously interfered with since the introduction of steam vessels. It is navigable without interruption from Bâle to its mouth, a distance of 550 miles, and much timber in rafts, coal, iron, and agricultural produce are conveyed by it. Large sums are spent every year in keeping the channel in order and in the erection or repair of river harbors, both in Germany and Holland. The shipping has greatly increased since the introduction of steam vessels, which also ply on the Main, the Neckar, the Maas, and the Moselle. The Rhine anciently formed the boundary between the Roman Empire and the Teutonic hordes. After the partition of the domains of Charlemagne in 843 it lay within the German Empire for nearly 800 years. France long cast covetous eyes upon the Rhine, and the Peace of Westphalia in 1648 gave her a footing upon the left bank. In 1801 the whole of the left bank of the Rhine was formally ceded to France. The Congress of Vienna in 1815 restored part of the Rhenish valley to Germany, and the cession by France of Alsace and Lorraine after the war of 1870–71 made the Rhine once more German. The Rhine is distinguished by the beauty of its scenery, which attracts many tourists. For a large part of its course it has hills on both sides at less or greater distances. Pleasant towns and villages lie nestled at the foot; above them rise rocky steeps and slopes clothed at one time with vines, at others with natural wood, and every now and then the castles and fastnesses of feudal times are seen frowning from precipices apparently inaccessible. The finest part for scenery is between Bingen and Bonn; after entering Holland the views are generally tame and uninteresting on account of the lack of elevation in the bordering country.

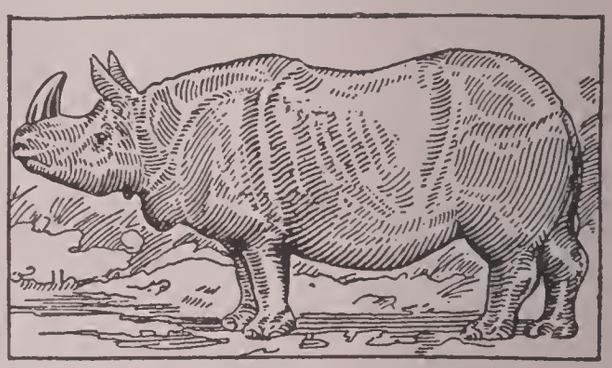
Rhine, CONFEDERATION OF. See *Confederation of the Rhine.*

Rhine Province. See *Rhenish Prussia.*

Rhine Wine. See *Rhenish Wines.*

Rhinobatidæ (rī-no-bat'i-dē), the shark-rays or beaked rays, a family of fishes, of which the sawfish is the most remarkable member. See *Sawfish.*

Rhinoceros (rī-nos'er-os), a genus of hoofed mammals, belonging to the perissodactylate or odd-toed division, allied to the elephant, hippopotamus, tapir, etc. They are large, ungainly animals, having short legs, and a very thick skin, which is usually thrown into deep folds. There are seven molars on each side of each jaw; there are no canines, but there are usually incisor teeth in both jaws. The feet are furnished with three toes each, encased in hoofs. The nasal bones usually support one or two horns, which are of the nature of epidermic growths, somewhat analogous to hairs. These animals live in marshy places, and subsist chiefly on grasses and foliage. They are exclusively confined to the warmer parts of the eastern hemisphere. The most familiar species is the one-horned or Indian rhinoceros (*Rhinoceros unicornis* or *indicus*), which, like all the Asiatic species, has the skin thrown into very definite folds, corresponding to the regions of the



Indian Rhinoceros (*Rhinoceros indicus*).

body. The horn is black, and usually very thick. The upper lip is very large, and is employed by the animal somewhat as the elephant uses his trunk. Though possessed of great strength, it is quiet and inoffensive unless provoked. The Javanese rhinoceros (*R. sondaicus*) is distinguished from the Indian chiefly by its smaller size. It has been trained to bear a saddle and to be driven. It occurs in Java, Sumatra, and Borneo. The Sumatran species (*R. sumatrensis*) is found in Sumatra and the Malay Peninsula. It has two horns, the foremost being the longer and sharper. The typical African rhinoceros (*R. bicornis*), is found in Southern Africa generally. Like other African species, it possesses no skin-folds. The horns are of very characteristic conformation, the front horn being broad and raised as on a base, sharp-pointed, and curved slightly backwards, while the hinder horn is short and conical

This animal is of ferocious disposition, is quick and active, and greatly feared by the natives. Other allied African species are the keitloa or Sloan's rhinoceros (*R. Keitloa*), the white rhinoceros (*R.* or *Ceratotherium Simus*), and the *Kobaoba* or long-horned, white rhinoceros (*R.* or *C. Oswelli*). The keitloa can readily be recognized by the horns, which are of considerable length, and nearly equal to each other in measurement. This is always a morose and ill-tempered animal, and on account of its size, strength, and length of horn is a dangerous opponent. The common white rhinoceros is larger than the keitloa, but its temper is remarkably quiet, and it is devoid of the restless irritability and sudden rage that characterizes the keitloa. The foremost horn of this animal is of very considerable length; the second horn is short and conical. The kobaoba makes its home far in the interior of the continent. The long horn of this animal is over four feet in length and is used by the Kaffirs to make 'knobberries' or knob-headed sticks, which they employ as clubs to be used in hand-to-hand encounters or to be thrown at an antagonist after the manner of a hand grenade. Fossil species are numerous, and range from the Miocene tertiary through the Pliocene and Post-pliocene deposits. *R. tichorhinus*, the 'woolly rhinoceros,' formerly inhabited England and ranged over a great part of Europe.

Rhinoceros-bird, or RHINOCEROS-HORNBILL. See *Hornbills.*

Rhinolophidæ (rī-no-lof'i-dē), a family of insectivorous bats, including the greater and lesser horseshoe bats. See *Bat.*

Rhinoplastic Operation (rīn-u-plas'tik), the surgical operation of restoring the nose when partly lost by disease or injury (early practiced in India by the Brahmans), by means of a triangular piece of skin cut from the forehead, and drawn down to its new position while still attached to the face by the lower angle. A piece of skin belonging to the arm has been employed for the same purpose, and the extreme joint of a finger has been used to support such an artificial nose. It is popularly known as the *Taliacotian operation*, from the name of the Italian surgeon who in the sixteenth century first made it public.

Rhio, or RIOUW (ri-ou'), a seaport belonging to the Dutch, in the Indian Archipelago, on an islet 50 miles southeast of Singapore. It consists of a European town, and a Chinese or native town, and having a capacious haven where large vessels find anchorage, carries on a considerable trade. It is the capital of a Dutch residency, comprising the islands of the Rhio Archipelago and other groups as well as districts on the east coast of Sumatra. The population of the residency is estimated at 90,000. The Rhio Archipelago is a group of small islands lying chiefly south and east of Singapore. Chief island Bintang.

Rhizantheæ (rī-zan'the-ē), or RHIZ'OGENS, a remarkable group of plants, considered by Lindley as forming a separate class, which he places in a position intermediate between the Thallogens and the Endogens. It consists of plants destitute of true leaves, but with short, amorphous stems parasitical on roots, and is divided by Lindley into the three orders, Balanophoraceæ, Cytinaceæ, and Rafflesiaceæ. By other botanists these orders are placed widely apart.

Rhizobolaceæ (ri-zu-bu-lā'se-ē), the suwarro-nut order of plants, of which only a few species are known, consisting of large exogenous trees growing in the forests of South America. One of them (*Caryocar butyrōsum*), a gigantic tree of Demerara, yields the suwarro, or souari nut, the kernel of which is esteemed as the most agreeable of the nut kind. The timber is used in shipbuilding.

Rhizomania (rī-zu-mā'ni-a), in botany, an abnormal development of some plants, as the vine and laurel, by which they throw out adventitious roots, indicating that there is something wrong with the proper root.

Rhizome (rī'zom), or ROOT-STOCK, in botany, a sort of stem running along the surface of the ground, or partially subterranean, sending forth shoots at its upper end and decaying at the other. It occurs in the ferns, iris, etc.; and in the ferns it may be wholly covered with the soil.

Rhizophaga (rī-zof'a-ga), root-eaters; one of the sections of the *Marsupialia* (which see).

Rhizophora (rī-zof'u-ra), the mangrove genus of plants. See *Mangrove.*

Rhizopoda (rī-zop'o-da), the lowest class of the Protozoa, comprehending animals which are destitute of a mouth, are single or compound, and possess the power of emitting pseudopodia. They are mostly minute, frequently microscopical, but some (such as the sponges) attain considerable size. Structurally the rhizopods consist of a mass of sarcode, are destitute of organs

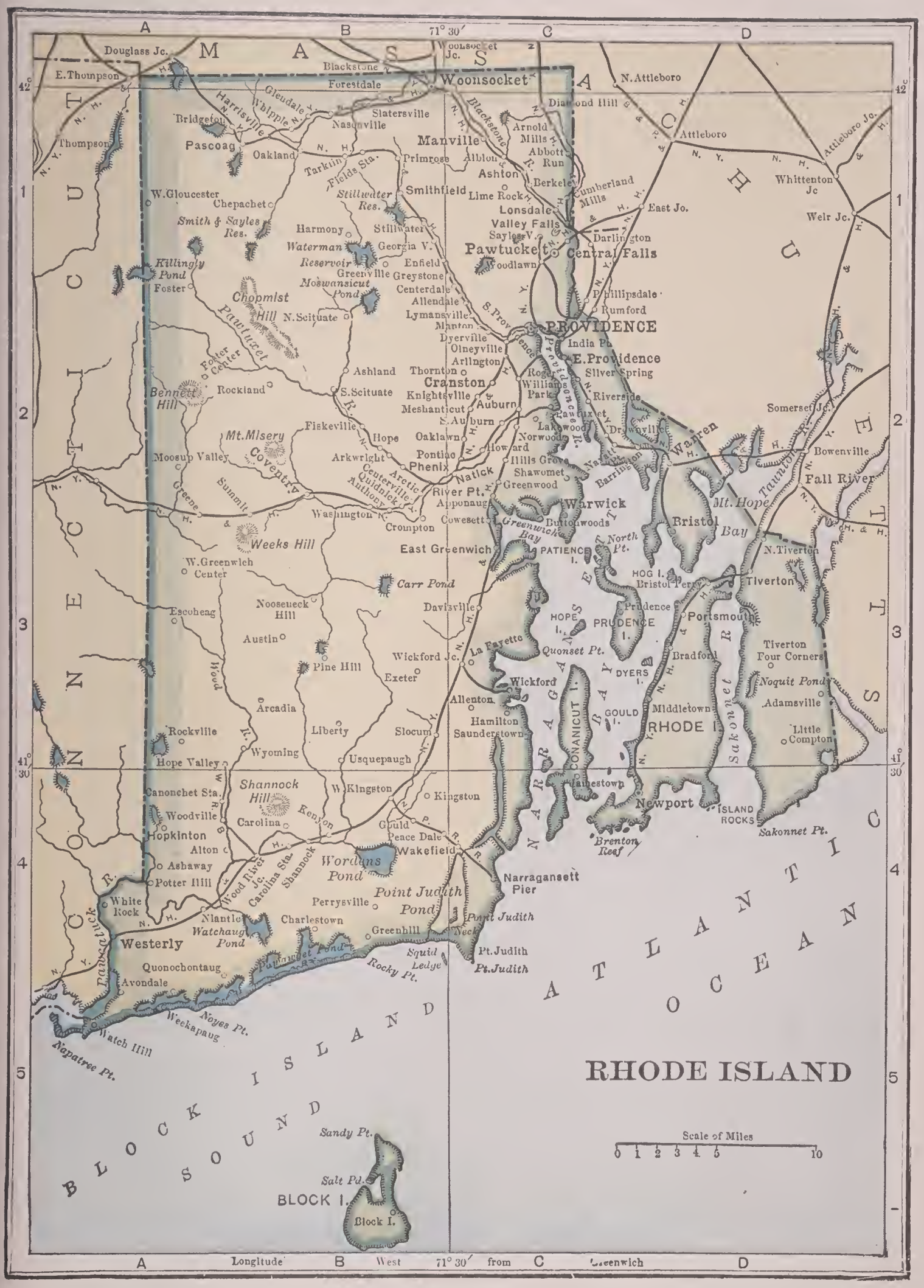
for digestion, etc. The characteristic from which they have their name is their capability of protruding processes (pseudopodia) from any part of their substance, sometimes as filaments or threads and sometimes finger-shaped, and retracting them at pleasure. Some, as the Foraminifera, are invested with a calcareous shell, sometimes consisting of one cell, but generally of an aggregation of minute chambers or cells, through the pores of which they protrude their fiber-like processes. The class has been divided into five orders — Monera, Amœba, Foraminifera, Radiolaria, and Spongida, though the last named, while resembling the protozoa in the character of their cells, being metazoin in structure, and usually considered a separate class. See separate entries.

Rhode Island (rōd' i'land), the smallest State of the American Union, bounded on the N. and E. by Massachusetts, W. by Connecticut, and S. by the Atlantic Ocean. Its total area is 1248 square miles, of which 197 are water. The surface, which in the north is hilly and rugged, but elsewhere generally level, is penetrated in the east by Narragansett Bay, a fine body of water about 30 miles long by 15 miles broad, and containing several islands, among them the one which gives the state its name. The estuaries which extend from the Bay, the Pawtuxet and Pawtucket or Blackstone Rivers, are the source of large water power development and maintain the great textile mills located along the banks. The climate is mild and equable, and well adapted, from its pleasant summers and temperate winters, for invalids from the south. The principal mineral industry consists of granite, which is mined extensively at Westerly. Originally an agricultural state, the growth of the cities has created many abandoned farms, but the increase in foreign population has caused many of these farms to be cultivated anew and extensive fruit orchards planted. Aquidneck, or the Island of Rhode Island, has excellent soil and has developed farms of great wealth. Manufactures form the staple industry; they consist of cotton, woolen, worsted, and mixed textiles, jewelry, and foundry and machine-shop products, silverware, rubber and elastic goods. The higher education is provided for by Brown University at Providence, one of the oldest colleges in the country. There is a state college at Kingston and a state normal school at Providence. The chief cities are Providence, Pawtucket, Woonsocket, and Newport, the first three manufacturing cities. Rhode Island is one of the six New England states, and one of the original thirteeen which formed the American Union. It was first settled by Roger Williams in 1636, its government being remarkable for that period in permitting entire freedom in religious matters. It was the last state to ratify the Federal Constitution, this not being done until 1790. Providence, the capital, is the second city in New England and the twenty-fifth city in the United States. It is a commercial city of much importance and is developing its harbor. Newport is the most fashionable of American seaside resorts. Pop. (1900) 428,556; (1910) 542,610; (1920) 604,397.

Rhode Island, an island situated in Narragansett Bay, from which the state of Rhode Island takes its name. It is about 15 miles long from north to south, and 3½ wide. and is divided into three townships — Newport, Portsmouth, and Middletown. It is fertile, pleasant, and healthful, and is a noted resort for invalids from southern climates.

Rhodes (rodz), Cecil John, a South African promoter, was born at Bishop-Stertford, England, July 5, 1853. Going to Natal for his health, he became interested in diamond mining, and eventually gained a controlling ownership in the Kimberley mines. He took an active part in South African politics, entered the ministry in 1884, and was prime-minister of Cape Colony 1890-96, when he resigned on account of charges of his connection with the Jameson raid. In 1889 he procured a charter for the British South Africa Company, conducted a war with the natives in Bechuanaland in 1893, and in 1896 put down a formidable rising of the Matabeles. His services in securing this region for Great Britain were acknowledged by its being named Rhodesia. He was in Kimberley during its siege by the Boers in 1899, they being eager to capture him, as they held him largely responsible for the war. An ambitious project of his was the building of a railway from the Cape to Cairo, traversing the entire length of Africa. This project has been in part accomplished. He died March 26, 1902, establishing by his will Rhodes Scholarships in Oxford University for students from the British colonies and the United States, also from Germany.

Rhodes (rōdz), an island in the Ægean Sea, belonging to Turkey, off the southwest coast of Asia Minor, from which it is separated by a channel 10 miles broad; area, 424 sq. miles. It is traversed north and south by an elevated mountain range, the


RHODE ISLAND
Scale of Miles
0 1 2 3 4 5 10
MASSACHUSETTS
CONNECTICUT
ATLANTIC OCEAN
BLOCK ISLAND SOUND
NARRAGANSETT BAY
Longitude West from Greenwich
71° 30′
42°
41° 30′
Douglass Jc.
E. Thompson
Thompson
Woonsocket Jc.
Woonsocket
Blackstone
Forestdale
Glendale
Whipple
Harrisville
Bridgeton
Pascoag
Oakland
Slatersville
Nasonville
Manville
Primrose
Albion
Ashton
Berkeley
Lime Rock
Lonsdale
Valley Falls
Sayles V.
Pawtucket
Woodlawn
Central Falls
Darlington
Cumberland Mills
East Jo.
N. Attleboro
Diamond Hill
Attleboro
Attleboro Jc.
Whittenton Jc
Weir Jc.
Arnold Mills
Abbott Run
Blackstone R.
Tarkiln
Fields Sta.
Stillwater Res.
Smithfield
Stillwater
Harmony
Georgia V.
Waterman
Reservoir
Greenville
Enfield
Greystone
Centerdale
Allendale
Lymansville
Manton
Dyerville
Olneyville
Arlington
Thornton
Cranston
Knightsville
Meshanticut
Auburn
S. Auburn
Oaklawn
Pontiac
Phenix
Natick
River Pt.
Apponaug
Cowesett
Greenwich Bay
Buttonwoods
Warwick
Shawomet
Greenwood
Hills Grove
Lakewood
Norwood
Drownville
Warren
Barrington
Bristol
Mt. Hope Bay
Bowenville
Fall River
Somerset Jc.
Taunton R.
N. Tiverton
Tiverton
Portsmouth
Bradford
Middletown
RHODE I.
Newport
ISLAND ROCKS
Sakonnet Pt.
Sakonnet R.
Tiverton Four Corners
Noquit Pond
Adamsville
Little Compton
Brenton Reef
Jamestown
CONANICUT I.
GOULD I.
DYERS I.
HOPE I.
PRUDENCE I.
Prudence
HOG I.
Bristol Ferry
North Pt.
PATIENCE I.
East Greenwich
Davisville
La Fayette
Quonset Pt.
Wickford Jc.
Wickford
Allenton
Hamilton
Saunderstown
Kingston
Gould
Peace Dale
Wakefield
Narragansett Pier
Point Judith Pond
Point Judith
Pt. Judith
Squid Ledge
Rocky Pt.
Pawtuxet R.
Pawtuxet
Foster Center
Foster
Killingly Pond
Chopmist Hill
N. Scituate
Ashland
S. Scituate
Rockland
Bennett Hill
Fiskeville
Hope
Arkwright
Arctic
Centerville
Quidnick
Anthony
Mt. Misery
Coventry
Moosup Valley
Summit
Greene
Washington
Crompton
Weeks Hill
W. Greenwich Center
Carr Pond
Nooseneck Hill
Escoheag
Austin
Pine Hill
Exeter
Arcadia
Liberty
Slocum
Usquepaugh
Wyoming
Rockville
Hope Valley
Canonchet Sta.
Shannock Hill
Woodville
Hopkinton
Carolina
Kenyon
Alton
Ashaway
Potter Hill
Wood River Jc.
Carolina Sta.
Shannock
Wordens Pond
Perrysville
Charlestown
Greenhill
White Rock
Westerly
Niantic
Watchaug Pond
Pawcatuck R.
Quonochontaug
Avondale
Pawtuxet Pond
Noyes Pt.
Weekapaug
Watch Hill
Napatree Pt.
Sandy Pt.
Salt Pd.
BLOCK I.
Block I.
Scale of Miles
0 1 2 3 4 5 10

highest point of which, Atairo, reaches a height of 4560 feet. Great part of the rest of the island is occupied by hills of more moderate elevation, which are covered with woods of ancient pines. The climate is delightful, and the soil fertile, producing grain, grapes, figs, pomegranates, oranges, etc. Steam navigation direct to the island has been established, and commerce is rapidly increasing. Pop. est. 30,000 to 35,000, of whom two-thirds are Greeks, the remainder Turks and Jews. Rhodes was a celebrated island in antiquity. It was settled by Dorians from Greece, and the Rhodians soon became an important maritime people, and for several centuries the island was a great seat of literature, art, and commerce. In A.D. 44 it was made part of the Roman province of Asia. It is famous for its prolonged defense by the Knights of St. John from 1309 till 1522, when they were forced to abandon the island to the Turks, with whom it has remained ever since.—RHODES, the capital, stands at the northeastern extremity of the island, rising from the sea in the form of an amphitheater, with fortifications mainly the work of the Knights of St. John. There are few remains of the ancient city, which was founded by the Dorians 408 B.C., and became one of the most splendid of ancient Greek cities. The celebrated Colossus of Rhodes stood for fifty-six years, and was prostrated by an earthquake 224 B.C. (See *Colossus.*) Pop. about 10,000.

Rhodesia (rō-dē'si-a), a division of South Africa annexed by the British in 1889 and so-called from Cecil Rhodes (*q. v.*), who was chairman of the British South Africa Company. The country is administered by this company. It is divided by the Zambesi into two sections: (1) *Northern Rhodesia;* area about 291,000 square miles; native population, 875,000; white population, 1500; the industries are maize, cotton, rubber, tobacco, zinc, gold, copper, lead and coal; (2) *Southern Rhodesia,* which consists of two provinces, Mashonaland and Matabeleland; area, 149,000 square miles; native population, 745,000; white population, 25,000; the industries are gold, coal, copper, silver, corn, tobacco. The chief towns in Southern Rhodesia are Buluwayo, Salisbury and Hartley. There have been several uprisings of the native Matabele, but since 1897 the country has for the most part enjoyed peace. The Cape-to-Cairo railroad, built north from Bulawayo, was continued to the border of the Belgian Congo in 1909.

Rhodium (rō'di-um), a metal belonging to the platinum group, discovered by Wollaston in 1804. It is of grayish-white color, very ductile and malleable, hard and very infusible, unaltered in the air at ordinary temperatures, but oxidizes at a red heat. It has been used for the points of metallic pens.

Rhodium Oil, a balsamic, volatile oil obtained from Canary Island rosewood, the woody root of *Convolvulus scoparius* and *floridus.* It is employed as a perfume, but there is also an artificial perfume so-called.

Rhododendron (rō-du-den'dron), a genus of evergreen shrubs with alternate, entire leaves, and ornamental flowers disposed in corymbs, belonging to a suborder of the Ericaceæ (heaths), and chiefly inhabiting the mountainous regions in Europe, North and South America, and Asia. The varieties are very numerous, and are much cultivated in gardens. The colors of the flowers range through rose, pink, lilac, scarlet, purple, red and white. *R. chrysanthum,* a Siberian species, possesses narcotic properties; *R. ferrugineum,* found in Switzerland, is called the rose of the Alps. *R. Dalhousiæ* is an epiphytic species. Dr. Hooker found *R. nivale* on the Tibetan mountains at a height of 16,000 to 18,000 feet. Major Madden states that in Kumaon *R. arboreum* grows to a height of 40 feet.

Rhodope (rō'do-pē), the ancient name of a range of mountains in European Turkey, partly forming the western boundary of Eastern Roumelia, and now called Despoto-Planina.

Rhombus (rom'bus), in geometry, a quadrilateral figure whose sides are equal and the opposite sides parallel, but whose angles are unequal, two being acute and two obtuse.

Rhondda (rond'da), a river in Glamorganshire, South Wales, which flows 14 miles S. E. through the Rhondda Valley to the Taff at Pontypridd. The Rhondda parliamentary division of Glamorgan consists of the township of Ystradyfodwg (which see).

Rhône (rōn; Latin, *Rhodănus*), a river in Europe which rises in Switzerland, near the east frontiers of the canton of Valais, about 18 miles W. S. W. of the source of the Vorder-Rhein. Its precise origin is the Rhône Glacier, 5581 feet above the level of the sea. It passes through the Lake of Geneva, and enters France, flowing first

southwards and then westwards to the city of Lyons, where it turns almost due south, and so continues till (after passing Avignon and Arles) it falls into the Gulf of Lyons by a greater and a smaller mouth, forming here an extensive delta. (See *Camargue.*) Its principal affluent is the Saône, which enters it at the city of Lyons; other large tributaries are the Isère and Durance. Its whole course is about 500 miles; its drainage area is 38,000 miles; and it is navigable for 360 miles. The great obstacles to its navigation are the rapidity of its current, the shifting character of its channel, and the variations that take place in the volume of its water; but these obstacles have to a great extent been removed by a recent scheme of regularization and canalization, intended to secure everywhere a depth of over 5 feet. By means of a series of magnificent canals the navigation of the Rhône has been continued, without interruption, to the Rhine (through the Saône), the Seine, and the Loire, and to the Meuse and the Belgian system.

Rhône, a department in France, in the basin of the Rhône, to which it sends its waters by the Saône (with the Azergues) and the Gier; area, 1077 square miles. The soil is only moderately fertile, and the wealth of the department is derived from its manufactures, the chief of which is silk, others being cottons and woolens, linens, machinery, and metal goods. The city of Lyons is the capital. Pop. 858,907.

Rhône, Bouches du. See *Bouches-du-Rhône.*

Rhubarb (rö'barb; *Rheum*), a genus of plants belonging to the nat. order Polygonaceæ. The species of this genus are large-leaved, herbaceous plants, natives of a considerable portion of Central Asia, with strong branching, almost fleshy roots and erect branching stems 6 to 8 feet high. They usually possess more or less purgative and astringent properties; this is essentially the case with their roots, and hence these are largely used in medicine. The principal kinds of medicinal rhubarb have received such names as Russian or Turkey, East Indian, Himalayan, Chinese, and English, according to their source or the route by which they have reached Europe. At present most of the Asiatic rhubarb comes from China, the plant yielding it being mostly *R. officināle.* English rhubarb is derived from *R. Rhaponticum,* which has long been cultivated for medical purposes in some parts of England as well as on the European continent, and is widely grown in the United States as a garden plant. The leaf-stalks of this species, as well as of *R. undulātum* and others, are now largely used for tarts, puddings, jam, etc., and the juice is made into a kind of wine.

Rhumb-line. See *Loxodromic Curve.*

Rhumbs (rums), the points of the compass. See *Compass.*

Rhus. See *Sumach.*

Rhyl (ril), a watering-place of North Wales, in Flintshire, near the mouth of the Clwyd. It has pure air and a fine sandy beach, with all the equipments of a watering-place, and possesses the charm of a most interesting country at the back. Pop. 9005.

Rhyme (rīm), more correctly Rime (A. Saxon, *rîm,* number), in poetry, a correspondence in sound of the terminating word or syllable of one line of poetry with the terminating word or syllable of another. To constitute this correspondence in single words or in syllables it is necessary that the vowel and the *final* consonantal sound (if any) should be the same, or have nearly the same sound, the initial consonants being different. English writers have allowed themselves certain licenses, and we find in the best English poets rhymes which strike an accurate ear as incorrect, such as *sky* and *liberty, hand* and *command, gone* and *alone.* Such rhymes may be tolerated if they only occur at rare intervals, but they must certainly be regarded as blemishes. If the rhyme is only in the last syllables, as in *forgave* and *behave,* it is called a *single* rhyme; if in the two last syllables, as *bitter* and *glitter,* it is called a *double* rhyme; if in the last three syllables, as *callosity* and *reciprocity,* it is called a *triple* rhyme. This last sort of rhymes is principally used in pieces of a comic or conversational character. Rhymes which extend to more than three syllables are almost confined to the Arabians and Persians in their short odes (*gazelles*), in which the same rhyme, carried through the whole poem, extends sometimes to four and more syllables. The modern use of rhyme was not known to the Greeks and Romans; though some rhymed verses occur in Ovid. It has been used, on the other hand, from time immemorial among the Chinese, Hindus, Arabs, and other oriental nations. Rhyme began to be developed among western nations in the Latin poetry of the Christian church. It is found used as early as the fourth century. The early English, German, and Scandinavian poems are distinguished by allitera-

tion instead of rhyme. (See *Alliteration.*) The Troubadours first attempted a variety of artificial combinations of rhyme in the sonnet, canzone, etc., and the Spaniards and Italians, with their musical languages and delicacy of ear, perfected the various forms of involved rhyme.

Rhymer (rī′mėr), THOMAS, of Erceldoune, or Earlston, in Berwickshire, otherwise called THOMAS THE RHYMER, was a half-legendary Scottish poet or romancer of the thirteenth century. He is mentioned by Barbour, Blind Harry, and Wyntoun, was credited with prophetical powers, and his *Prophecies*, a collection of oracular rhymes, were long popular in Scottish folk-lore. The old metrical romance of *Sir Tristram* is doubtfully ascribed to him.

Rhymney (rim′ni), a town in South Wales, chiefly in Monmouthshire, partly in Brecknock, on the river Rhymney, 22 miles N. of Cardiff, has large iron and steel works, including blast furnaces and rolling-mills. Pop. (1911) 13,336.

Rhynchonella (rin-ko-nel′la), a genus of brachiopodous molluscs. As many as 250 fossil species are numbered from the lower Silurian upward, but only two or three living species are known, inhabiting the deeper parts of the Arctic and Antarctic Oceans.

Rhynchops (rin′kops). See *Scissorbill.*

Rhythm (rithm), in general, means a measured succession of divisions or intervals in written composition, music, or dancing. The rhythm of poetry is the regular succession of accent, emphasis, or voice stress; or a certain succession of long and short (heavy and light) syllables in a verse. Prose also has its rhythm, and the only difference (so far as sound is concerned) between verse and prose is, that the former consists of a regular succession of similar cadences, or of a limited variety of cadences, divided by grammatical pauses and emphases into proportional clauses, so as to present sensible responses to the ear at regular proportioned distances. In music, rhythm is the disposition of the notes of a composition in respect of time and measure; the measured beat which marks the character and expression of the music.

Rhytina (rī-tī′na), a genus of mammalia, closely allied to the manatee and dugong, which has become extinct within the last century or so. The only known species of Rhytina (*Rhytina Stelleri*) was discovered in 1741 by the Russian naturalist Steller on an island in Bering's Straits, on which he and a party of sailors had been shipwrecked. The animals were fish-like in shape, and of great size — specimens measuring 25 feet in length and 20 feet in greatest circumference. The head was small. The tail-fin was crescentic in form, and front limbs only were developed.

Rialto (rē-al′tō). See *Venice.*

Riazan, or RYAZAN (ryå-zån′), capital of a government of the same name in Central Russia. The town is situated on the Trubesh, a tributary of the Oka, in the center of a rich agricultural district, and has a large trade, more especially in rye. Manufactures include woolens, linens, needles, and leather. Pop. 44,552.— The government has an area of 16,254 square miles, and is wholly drained by the Oka and its tributaries. The surface on the right of the Oka is largely swampy and has extensive forests; on the left it is generally fertile. Cereals of all kinds are produced for export. The principal manufactures are cotton, linen, leather, and spirits. Pop. 1,827,085.

Rib, the name given to the curved bones which in man and the other vertebrates spring from either side of the spine or vertebral column, and which may or may not be joined to a sternum or breast-bone in front. The ribs ordinarily agree in number with the vertebræ of the back or dorsal region. Thus in man twelve dorsal vertebræ and twelve pairs of ribs exist. The *true* or sternal ribs are the first seven, which are articulated at one extremity of the spine, and at the other to the sternum by means of cartilages. The *false* or short ribs are the remaining five; the uppermost three being united by their cartilages to the cartilage of the last *true* rib. The others are free at their sternal extremity, and hence have been called 'floating ribs.' Ribs are wanting in such lower fishes as lampreys, lancelets, etc., and in amphibians such as frogs and toads. The number of these bones may be very great in certain species, and they are occasionally developed in the cervical and pelvic regions in reptiles and birds respectively.

Rib, in architecture, a term applied variously, as for instance to an arch-formed piece of timber for supporting the lath and plaster work of a roof; a plain or ornamented molding on the interior of a vaulted roof; to the moldings of timber roofs, and those forming tracery on walls and in windows.

Ribble (rib'l), a river of Yorkshire and Lancashire, rises at Wharnside Mountain, and flows generally S. and S. W. till it expands below Preston into an estuary of the Irish Sea. Since 1885 vast river diversion works, and the construction of a dock at Preston, have been going on, which, when completed, will greatly improve the navigation of the river.

Ribbon (rib'un), a narrow web, generally of silk, used for tying and ornamental purposes. Ribbon-weaving is a special branch of the textile industries. In modern looms as many as forty ribbons are simultaneously woven in one machine. Ribbon-weaving was established near St. Étienne in France in the eleventh century. In England Coventry is an important seat of this industry, which is also carried on at Norwich and Leicester, and in various parts of the United States. Mixed fabrics of silk and cotton are now largely employed. The terms *blue ribbon* and *red ribbon* are often used to designate the orders of the Garter and Bath respectively, the badge of the former being supported by a blue ribbon, and that of the latter by a red ribbon.

Ribbon-fishes, the name of certain deep-sea fishes met with in all parts of the ocean, generally found floating dead on the surface, or thrown ashore by the waves. The body is like a band from 15 to 20 feet long, 10 to 12 inches broad, and an inch or two thick. These fishes are generally silvery in color. They live at such a depth that when they reach the surface the expansion of gases in the body so loosens all parts of the muscular and bony system that some portions are nearly always broken on lifting them out of the water. The fin rays in young ribbon-fishes are extraordinarily developed, some of them being several times longer than the body. The deal-fish (*Trachypterus arcturus*) is often met with in the North Atlantic, and is sometimes found after gales on the Scottish coasts. See *Deal-fish, Oar-fish.*

Ribbon-grass, CANARY-GRASS, a garden variety, striped with green and white, of *Phalaris arundinacea*, a grass which is found in its wild state by the sides of rivers. Called also *gardener's garters.*

Ribbonmen, the members of a secret society organized among the Roman Catholics in Ireland about the beginning of the last century in opposition to that of the Orangemen. It originated in Armagh, and spread thence to Down, Antrim, Tyrone and Fermanagh. The organization of the society was similar to that of the Orangemen, but by no means so complete. The membership from the first was drawn almost exclusively from the lowest classes of the population.

Ribbon-worms, a group of annuloid animals belonging to the suborder Nemertida, a division of the order Turbellaria of the Platyelmia or 'Flat-worms.' The leading characteristics of ribbon-worms are an elongated, worm-like body, an alimentary canal terminating in a distinct anus, and a protrusible proboscis. These forms are marine in habits, and are not parasitic. The sexes are generally separate, and reproduction may be subserved by ova, by gemmation or budding, or by division of the body substance.

Ribe (rē'be), or RIPEN, a town of Denmark, in the southwest of Jutland, on the Ribe, about 3 miles from its mouth. It has a cathedral of the twelfth century, and was once a flourishing port. Pop. 4243.

Ribeauville (ri-bō-vēl). Same as *Rappoltsweiler.*

Ribe'ra, GIUSEPPE. See *Spagnoletto.*

Ribes (rī'bēs), a genus of plants of the natural order Grossulariaceæ, comprehending the gooseberry and the currants. A species with scarlet flowers (*R. sanguineum*), and a variety of this with white flowers, are much cultivated as ornamental shrubs.

Ricardo (rē-kar'do), DAVID, a celebrated writer on finance and political economy, was the son of a Jewish stock broker, and was born in London in 1772; died in 1823. In 1793 he embraced Christianity and married a Christian wife. He then began business as a stock broker on his own account, and in a short time realized an immense fortune. His first publication was on the subject of the depreciation of the national currency (1810). He then published an *Essay on Rent*, and his name is usually associated with a certain distinctive view on this subject. (See *Rent.*) In 1816 he wrote a pamphlet entitled *Proposals for an Economical and Secure Currency.* But his most important work is his *Treatise on Political Economy and Taxation*, which appeared in 1817. In 1819 he entered parliament as member for Portarlington. In 1822 he published a pamphlet on *Protection to Agriculture.* Though his mode of treatment is totally different, he belongs essentially to the school of Adam Smith.

Ricciarelli (rit-chä-rel'lē). DANIELE, better known by the

name of DANIELE DA VOLTERRA, an Italian painter, born at Volterra in 1509. He studied painting at Siena, and afterwards repaired to Rome, where he was much indebted to the friendship of Michael Angelo, who not only instructed him, but gave him designs for some of his most celebrated works. His fame rests chiefly on a series of frescoes in the church of La Trinità de' Monti, Rome; and of these the *Descent from the Cross* is well known by Toschi's admirable engraving. Ricciarelli was employed by Paul IV to partially drape the nude figures in Michael Angelo's *Last Judgment* in the Sistine Chapel of the Vatican. By this act he earned for himself the soubriquet of *Il Braghettone* (The Breeches-maker). In the latter part of his life Ricciarelli applied himself also to sculpture. He died at Rome in 1566 or 1567.

Riccio. See *Rizzio.*

Rice (rīs; *Orĭza satīva*), a cereal plant, natural order Graminaceæ or Grasses. This important food-plant was long known in the East before it was introduced into Egypt and Greece. It is now cultivated extensively in the low grounds of the tropical and subtropical parts of southeastern Asia, Egypt, Japan, part of the Southern United States, and in several districts of Southern Europe. The culm of the rice is from 1 to 6 feet high, annual, erect, simple, round, and jointed; the leaves are large, firm, and pointed, arising from very long, cylindrical, and finely striated sheaths; the flowers are disposed in a panicle somewhat resembling that of the oat; the seeds are white and oblong, but vary in size and form in the numerous varieties. In the cultivation of this plant a high summer temperature is required, combined with abundance of water. Thus the seaboard areas and river deltas which are subject to inundation give the best conditions, otherwise irrigation is necessary. The amount of water required by the plant depends upon its strength and stage of growth. In Egypt it is sown while the waters of the Nile cover the land, and the rice plant grows luxuriantly in the rich alluvial deposits left by the receding flood. The Chinese obtain two crops a year from the same ground, and cultivate it annually on the same soil, and without any other manure than the mud deposited by the water of the river used in overflowing it. The young plants are transplanted into plowed furrows, and water is brought over them and kept on till the plants begin to ripen. The first crop is cut in May, and a second is immediately prepared for by burning the stubble, and this second crop ripens in October or November. In India two harvests are obtained in the year, especially in Bengal, and frequently two crops are taken from the same field. In Japan, the Philippines, Ceylon, and Java rice is cultivated much in the same manner. Mountain rice is a hardy variety which thrives on dry soil; and in India it is cultivated at an altitude of 8000 feet. Rice can be profitably cultivated only in warm countries, but has for some time past been grown in South Germany and Italy. In the United States it is grown chiefly in the swampy districts of South Carolina, Georgia, Louisiana and Texas. In the husk rice is known by the name of 'paddy.' Rice is more largely consumed by the inhabitants of the world than any other grain, the people of Eastern Asia and its islands largely living on it; but it contains less flesh-forming matter (nitrogenous), than the others, this element being, in 100 parts of rice, only 6.5. At one period Europe was supplied from America, but this source has been almost entirely superseded by Lower Burmah, India, Siam, Japan, and Cochin-China. The inhabitants of the East obtain from rice a vinous liquor more intoxicating than wine; and *arack* is also made from it. See *Arack.*

Rice (*Orĭza sativa*).

Rice, INDIAN. See *Canada Rice.*

Rice-bunting, a name given to two distinct birds. The first, also known by the name 'bob-o'-link,' is the *Emberiza oryzivŏra* (or *Dolichonyx oryzivŏrus*), a bird of the bunting family, which migrates over N America from Labrador to Mexico, appearing in Massachusetts about the be-

Rice-bunting (*Oryzornis oryzivŏra*).

ginning of May. Its food is insects, worms, and seeds, including rice in South Carolina. It is the reed bird of the Middle States, pausing in its migration to feed on the seed of the riverside reeds. The song of the male is singular and pleasant. When fat their flesh becomes little inferior in flavor to that of the European ortolan. The other species known as the rice-bunting is the *Oryzornis oryzivŏra*, also known as the Java sparrow and paddy bird. It belongs to the true finches, a group nearly allied to the buntings. It possesses a largely-developed bill; the head and tail are black, the belly rosy, the cheeks of the male white, and the legs flesh-colored. It is dreaded in Southern Asia on account of the ravages it commits in the rice-fields. It is frequently brought to Europe, and is found in aviaries.

Rice-paper, a substance prepared from thin, uniform slices of the snow-white pith of *Aralia papyrifera*, which grows in Formosa. Rice-paper is prepared in China, and is used in the manufacture of artificial flowers and by native artists for water-color drawings.

Rich, Edmund, an English ecclesiastic, born at Abingdon about 1195. He studied theology at Paris, afterwards taught the Aristotelian logic and scholastic philosophy in Oxford, and was prebendary and treasurer of Salisbury Cathedral 1219-22. He preached the sixth crusade in 1227, became archbishop of Canterbury in 1233, and exhibited great energy as a reformer. His authority was superseded by that of the legate, Cardinal Otho, and being unable to obtain redress at Rome he retired to France in 1240 and died in 1242. He was canonized in 1249.

Richard I, King of England, surnamed Cœur de Lion, second son of Henry II by Eleanor of Aquitaine, was born at Oxford in 1157. He several times rebelled against his father, and in 1189, supported by the King of France, he defeated the forces of Henry, who was compelled to acknowledge Richard as his heir. On Henry's death at Chinon, Richard sailed to England and was crowned at Westminster (September, 1189). The principal events of his reign are connected with the third crusade, in which he took part, uniting his forces with those of Philip of France. In the course of this crusade he married the Princess Berengaria of Navarre in Cyprus. In the crusade he showed himself a warrior of great strength and boldness, but made enemies of his fellow prince by his autocratic demeanor. Richard left Palestine in 1192 and sailed for the Adriatic, but was wrecked near Aquileia. On his way home through Germany he was seized by the Duke of Austria, whom he had offended in Palestine, and was given up a prisoner to the Emperor Henry VI. During his captivity his brother John headed an insurrection in England in concert with the King of France, but Richard, who was ransomed, returned to England in 1194, and the movement came to nothing. Richard then passed over to Normandy, and spent the rest of his life there in warfare of no decisive character. He died in April, 1199, of a wound received while besieging the castle of Chalus. Richard was thoroughly neglectful of his duties as a king, and owes his fame chiefly to his personal bravery.

Richard II, King of England, son of Edward the Black Prince, and grandson of Edward III, was born at Bordeaux in 1366. He succeeded the latter in 1377. In 1381 took place the insurrection headed by Wat Tyler, in the suppression of which the boy-king showed considerable capacity and boldness, but his after life did not correspond with this early promise. In his sixteenth year (1382) he married Anne, daughter of the Emperor Charles IV. Wars with France and Scotland, and the ambitious intrigues of the Duke of Lancaster, one of his uncles, disquieted some succeeding years. The proper government of the kingdom was interfered with by contests for power between the king with his favorites, and his uncle, the Duke of Gloucester, backed by the parliament. In 1389 the king dismissed Gloucester and his adherents from his council, and took the reins of government himself. In 1394 Anne of Bohemia died, and two years later Richard married Isabella of France. This marriage was strongly opposed by the Duke of Gloucester, who, in consequence, was suffocated in Calais, where he had been sent for safe custody. A quarrel having broken out between Richard's cousin, the Duke of Hereford, son of John of Gaunt, and the Duke of Norfolk, Richard banished them both. The next year, 1399, the Duke of Lancaster died, and Richard confiscated his estates. This unjust act was the immediate cause of the king's fall. During his absence in Ireland, Bolingbroke, as the Duke of Hereford was called, landed in Yorkshire with a small force, and the king on his return to England was solemnly deposed by parliament, September 30, 1399, and the crown was awarded to Henry. (See *Henry IV.*) Richard was imprisoned

in the castle of Pomfret, where he is generally supposed to have been murdered in 1400.

Richard III, King of England, the last of the Plantagenet kings, born at Fotheringhay Castle in 1450, was the youngest son of Richard, Duke of York, who was killed at Wakefield. On the accession of his brother, Edward IV, he was created Duke of Gloucester, and during the early part of Edward's reign served him with great courage and fidelity. He took for wife in 1473 Anne Neville, joint-heiress of the Earl of Warwick, whose other daughter was united to the Duke of Clarence, and quarrels soon rose between the two brothers over their wives' inheritance. On the death of Edward in 1483, the Duke of Gloucester was appointed protector of the kingdom; and he immediately caused his nephew, the young Edward V, to be declared king, and took an oath of fealty to him. But Richard soon began to pursue his own ambitious schemes. Earl Rivers, the queen's brother, and Sir R. Grey, a son by her first husband, were arrested and beheaded at Pomfret, and Lord Hastings, who adhered to his young sovereign, was executed without trial in the Tower. It was now asserted that the king and his brother were illegitimate, and that Richard had a legal title to the crown. The Duke of Buckingham supported Richard, and a body of peers and citizens having offered him the crown in the name of the nation he accepted it, and on July 8, 1483, was crowned at Westminster. The deposed king and his brother were, according to general belief, smothered in the Tower of London by order of their uncle. (See *Edward V.*) Richard governed with vigor and ability, but was not generally popular, and in 1485 Henry, Earl of Richmond, head of the house of Lancaster, landed with a small army at Milford Haven. Richard met him on August 23d with an army of 15,000 men at Bosworth, in Leicestershire. Richmond had only 6000 men, but relied on the secret assurances of aid from Stanley, who commanded a separate royal force of 7000. In the midst of the battle, Stanley, by falling on the flank of the royal army, secured the victory to Richmond, Richard being slain on the field. (See *Henry VII.*) Richard possessed courage as well as capacity; but his conduct showed cruelty, dissimulation, treachery, and ambition. He has been represented as of small stature, deformed, and of a forbidding aspect; but his personal defects have probably been magnified.

Richard, Earl of Cornwall and Emperor of Germany between 1256 and 1272, during the so-called interregnum, was a son of King John of England, and was born in 1209. In his youth he commanded with success the army of his brother Henry III in France. In 1236 he took the cross and went to the Holy Land, but was not able to effect much in the East. In 1256 he was chosen Emperor of Germany by a faction, and was crowned King of the Romans at Aix-la-Chapelle in 1257. He was unable to obtain general recognition, and was more than once driven to take refuge in England, where he was taken prisoner by Simon de Montfort at the battle of Lewes in 1264. In 1268 he again visited Germany, and held a diet at Worms in the following year. He died in England April 2, 1272.

Richard of Cirencester, or RICARDUS CORINENSIS, a monkish chronicler of the fourteenth century, sometimes called the Monk of Westminster. He entered the Benedictine monastery of St. Peter's, Westminster, residing there during the remainder of his life; in 1391 he visited Rome. He died in his monastery about 1402. He is the author of a Latin history of England to the year 1348. The so-called *Itinerary of Richard,* '*De Situ Britanniæ,*' published in 1758, and formerly much referred to as an authority on Roman Britain, was a forgery perpetrated by Dr. C. J. Bertram of Copenhagen.

Richards, WILLIAM FROST, painter, was born at Philadelphia, Pennsylvania, Nov. 14, 1833; died Nov. 8, 1905. He studied art in Europe, had a studio in London 1878-80, and resided many years in his native city. Among his well-known pictures are *Midsummer Woods in June, Old Ocean's Gray and Melancholy Waste,* and *The Wissahickon,* the last exhibited at the Centennial Exposition in 1876. His later works are chiefly marine pictures.

Richardson (rich'ard-son), SIR BENJAMIN WARD, was born at Somerby, Leicestershire in 1828, was graduated in medicine at St. Andrew's University in 1854. In 1885 he edited the *Journal of Health;* and he gained the Astley Cooper prize by his treatise on *The Cause of the Coagulation of the Blood,* and the Fothergillian gold medal by a disquisition on the *Diseases of the Fœtus,* in 1856. He originated the use of ether spray for the local abolition of pain in surgical operations, and introduced methylene bichloride as a general anæsthetic. He was a fellow of the

Royal College of Physicians and of the Royal Society, and was the president of the Medical Society of London. He published several works upon medicine and hygiene, and was an earnest sanitary and temperance reformer. He was knighted in 1893 and died in 1896.

Richardson, CHARLES, lexicographer, was born in 1775; died in 1865. He was trained as a barrister, but devoted himself to literature. In 1815 he published *Illustrations of English Philology.* In 1818 he undertook the lexicographical articles in the *Encyclopædia Metropolitana,* and afterwards published his great work, a *New Dictionary of the English Language* (2 vols. 1835-37). He also wrote a work on the *Study of Languages* (1854), and contributed frequently to the *Gentleman's* and other magazines.

Richardson, SIR JOHN, naturalist and Arctic traveler, born at Dumfries in 1787; died near Grasmere in 1865. After studying medicine at the University of Edinburgh he entered the royal navy, in 1807, as assistant-surgeon. He served on various stations till 1819, and was surgeon and naturalist to the Arctic expeditions of 1819-22 and 1825-27, under Sir John Franklin, exploring on the latter occasion the shores of the Arctic Ocean between the Mackenzie and Coppermine rivers. He wrote *Geognostical Observations* as an appendix to the *Narrative* published by Franklin (1829, London), and edited, along with Kirby and Swainson, the *Fauna Boreali-Americana* (4 vols., 1829-37). In 1838 he was appointed physician to the fleet, and in 1846 was knighted. In March, 1848, he took charge of an expedition to search for Franklin, and on his return published *The Arctic Searching Expedition* (1851) and *The Polar Regions* (1861).

Richardson, SAMUEL, an English novelist, was born in 1689 in Derbyshire, and received only a common school education. He early manifested a talent for story-telling and letter-writing, and at the age of thirteen was the confidant of three young women in their love secrets, and employed by them in their amatory correspondence. At the age of sixteen Richardson was bound apprentice to Mr. John Wilde, a London printer, and afterwards set up as a printer for himself and developed a successful business. When he was nearly fifty he was asked by two booksellers to compose a familiar letter writer.' In doing this he threw the letters into the form of a story, which he published (1741) under the title of *Pamela, or Virtue Rewarded.* So great was its popularity that it ran through five editions in one year, and was even recommended from the pulpit. In 1749 the appearance of a second novel, *Clarissa Harlowe,* fully established his literary reputation. The *History of Sir Charles Grandison* appeared in 1753, and was also received with great praise. In 1754 Richardson became master of the Stationers' Company, and in 1760 purchased a moiety of the patent of law printer to the king. He died July 4, 1761, and was buried in the Church of St. Bride, in Fleet Street.

Richelieu (rēsh-ly*eu*), ARMAND JEAN DU PLESSIS, CARDINAL, DUC DE, a famous French statesman, born at Paris, September 9, 1585; died there, December 4, 1642. He was the son of François Duplessis, seigneur de Richelieu in Touraine, and was originally destined for the army; but his brother, Alphonse, having resigned the bishopric of Luçon, this was bestowed on him by Henry IV (1606). He obtained from the pope a dispensation allowing him to accept the office though under age, and in 1607 was consecrated by the Cardinal de Givry in presence of the pope himself (Paul V). For several years he devoted himself to the duties of his see, reforming abuses, and laboring for the conversion of Protestants. But his ambition always made him turn his eyes towards the court, and having come to Paris in 1614 as deputy of the clergy of Poitou to the states-general, he managed to insinuate himself into the favor of the queen-mother, Marie de Medici, who obtained for him the post of grand-almoner, and in 1616 that of secretary of state for war and foreign affairs. When Louis XIII quarreled with his mother (1617) Richelieu fell with her, and was banished first to Blois and then to Avignon. In 1620, however, he managed to effect a reconciliation between Mary of Medici and her son. He now obtained, through the influence of the queen-mother, the cardinal's hat, and in 1624 was admitted into the council of state. From this date he was at the head of affairs, and he at once began systematically to extend the power of the crown by crushing the Huguenots, and overthrowing the privileges of the great vassals; and to increase the influence of the French monarchy by undermining that of the Hapsburgs, both beyond the Pyrenees and in Germany. The rallying point of the Huguenots was Rochelle; and Richelieu laid siege to that city, commanding the army in person. Rochelle, supported by supplies from England, held out for some time, but was compelled to surrender by famine (Oct. 29

Richmond Chamber of Commerce

THE LEE MONUMENT AT RICHMOND

One of the finest types of equestrian statues is that of General Robert E. Lee, located in what is known as Lee Circle, on Monument Avenue, Richmond, Va.

1628). In order to overthrow the power of the great nobles he ordered the demolition of all the feudal fortresses which could not be used for the defense of the frontiers. After the suppression of the Huguenots his next step was the removal of the queen-mother from court, she having endeavored to effect his fall. This he accomplished in November, 1630. But this step, and the almost total annihilation of the privileges of the parliaments and the clergy, united all classes against the despotism of the cardinal, and several risings and conspiracies took place, which were suppressed by prudent and vigorous measures. In 1631 Richelieu was raised to the rank of duke. In 1632 a rising in favor of the Duke of Orleans, the king's brother, was suppressed by the royal forces directed by Richelieu, and the Duke of Montmorency was executed. The whole period of his government was marked by a series of conspiracies of the feudal nobility, the queen-mother, the queen herself, and even Louis, against the royal power exercised by Richelieu. But he was prepared at every point and his vengeance sure. During the Thirty Years' war the cardinal employed all the arts of negotiation and even force of arms to protect the Protestants of Germany, for the purpose of humbling the power of Austria. For the same object he declared war against Spain in 1635, and the separation of Portugal from Spain was effected by his assistance (1640). He also endeavored to weaken Austrian influence in Italy, and procured the transfer of the duchy of Mantua to the Duke of Nevers. Among the last to be crushed by him were Cinq-Mars and De Thou, who, with the king's approval, attempted to ruin the great minister. Before his death he recommended Cardinal Mazarin as his successor. Richelieu was a great statesman, but he was proud, arrogant, and vindictive. He was a patron of letters and art, and founder of the French Academy and the Jardin des Plantes.

Richmond (rich'mund), an ancient municipal borough of England, in the county of and 42 miles northwest of York (North Riding), on the left bank of the Swale. It is picturesquely situated, and has numerous interesting remains of antiquity, the most remarkable of which is the castle, comprising an area of nearly 6 acres, and one of the most majestic ruins in England. Pop. (1911) 3934.

Richmond, a town of England, in the county of Surrey, 12 miles W. S. W. of London, partly on an acclivity of Richmond Hill, and partly on a plain along the Thames. It is a favorite resort of Londoners for boating and other recreations, the scenery in the vicinity being very beautiful. Richmond was a favorite residence for many centuries of the monarchs of England, several of whom died there. The great park of Richmond, formed by Charles I, is enclosed by a brick wall 8 miles in length. Pop. 33,223.

Richmond, a city of Contra Costa Co., California, 9 miles N. of Oakland. It has steel plant, oil refineries, porcelain factories, car shops, etc. Pop. (1920) 16,843.

Richmond, a city, county seat of Wayne Co., Indiana, 68 miles E. of Indianapolis, on Whitewater River. It is an important industrial center, with manufactures of farm implements, automobiles, machinery, furniture, undertakers' supplies, brass and iron goods, underwear, automatic tools, etc. It is the seat of Earlham College (Orthodox Friends). Pop. (1910) 22,324; (1920) 26,765.

Richmond, a city of Kentucky, county seat of Madison Co., 25 miles S. E. of Lexington. Has livestock and tobacco interests. The Madison Female Institute and a State normal school are situated here. Pop. (1920) 5622.

Richmond, the capital of Virginia, is finely situated on the north side of James River, at the head of tidewater, 100 miles S. by W. of Washington. The streets are generally wide and well built, and mostly intersect each other at right angles. There are many fine buildings, including the capitol, governor's house, city hall, federal buildings, buildings of Richmond College, the Jefferson Davis Mansion (now a museum of Confederate relics), the Chief Justice Marshall residence, exposition buildings, Soldiers' Home, etc. The State House or Capitol contains Houdon's celebrated marble statue of Washington, and in the Capitol grounds are Foley's bronze statue of General T. J. ('Stonewall') Jackson and Crawford's bronze statue of Washington, 25 feet high, on a pedestal 42 feet high, surrounded by other bronze statues. There is a fine system of parks, a national cemetery and the famous Hollywood Cemetery in which are the graves of Presidents Monroe and Tyler, John Randolph, Jefferson Davis, and others of note. There are a number of collegiate institutions. Water-power is almost unlimited, and the various mills and factories give employment to numerous workmen, the tobacco and iron industries being of great importance. The trade staples are tobacco, iron, grain, and flour.

The manufacturing industry represents an investment of $40,000,000. doing an annual business of $140,000,000. Richmond is the seat of the Fifth Federal Reserve district. Bank deposits in excess of $200,000,000. The first occupation of any part of its site was by English settlers in 1609; the city was formally founded in 1742, and became the seat of government in 1780. It was the seat of the Confederacy, 1861-65, and was evacuated April 2, 1865. Pop. (1900) 85,050; (1910) 127,628; (1920) 171,667.

Richmond, a borough of New York City, comprising the whole of Staten Island, in New York Harbor. Pop. (1900) 67,021; (1910) 85,969; (1920) 115,959.

Richter, GUSTAV, a German painter, born at Berlin in 1823; died there in 1884. He was a member of the Academies of Berlin, Munich, and Vienna; executed frescoes in the Berlin Museum, and attracted attention by his *Raising of Jairus' Daughter* and his *Building of the Pyramids*, a colossal picture (at Munich). It is on his portraits, however, that his fame chiefly rests, his sitters having included many European celebrities.

Richter, JEAN PAUL FRIEDRICH, commonly called JEAN PAUL, a German writer, was born March 21, 1763, at Wunsiedel, in the Fichtelgebirge, and died November 14, 1825, at Baireuth. His father was, at the time of his birth, a teacher and organist at Wunsiedel; at a later period pastor at Schwarzenbach on the Saale. In 1781 Richter entered the University of Leipzig in order to study theology, but soon changed his plan, and devoted himself to literature. In 1784 he was forced by poverty to leave Leipzig. In 1787-94 he was a private tutor, but in the meantime he had published his *Grönlandische Processe* ('Greenland Lawsuits,' 1783-84), *Auswahl aus des Teufels Papieren* ('Selection from the Devil's Papers,' 1789), and *Die unsichtbare Loge* ('The Invisible Lodge,' 1793). This brought him fame and money, and was followed by another romance, *Hesperus* (1795), and *The Life of Quintus Fixlein* (1796), a humoristic idyl, works which made his name one of the best known in Germany. In 1798 he went to Weimar, and subsequently moved to other towns, finally settling at Baireuth in 1804. He shortly afterwards received a pension from the prince-primate, Dalberg, which was afterwards continued by the King of Bavaria. While staying in Berlin in 1801 he married Karoline Mayer, a union which proved very happy. His last years were saddened by the death of his only son in 1821. Jean Paul's works (he wrote under this name) are characterized by a deeply reflective and philosophic humor, but are often whimsical and fantastic. They are full of good things, but show no sense of proportion, arrangement, or artistic finish. His writings, other than those noted above, include *Blumen-, Frucht- und Dornenstücke* ('Flower, Fruit, and Thorn Pieces,' 1796), *Der Jubelsenior* ('Parson in Jubilee,' 1797), *Das Kampaner Thal* (1797), *Titan* (1800), *Flegeljahre* (translated by Carlyle 'Wild Oats,' 1804). *Die Vorschule der Aesthetik* ('Introduction to Æsthetics'), his first important philosophical work, appeared in 1804. It was followed by *Levana, oder Erziehungslehre* (1807), a work on education. His works connected with the history and politics of the time were: *Friedenspredigt* (1808), *Dämmerungen für Deutschland* (1809); *Mars und Phöbus' Thronwechsel im Jahr 1814* (1814), and *Politische Fastenpredigten* (1817).

Richthoven (rik'to-fĕn), FERDINAND BARON VON, traveler, born at Karlsruhe, Silesia, in 1833; died in 1905. For twelve years, 1860-72, he traveled in Europe and the Western United States and was subsequently professor of geology at Rome, and of geography at Leipzig and Berlin. In 1902 he was made director of the Institut für Meeneskunde. His works on the geography and geology of China are of high value.

Ricimer (ris'i-mĕr), a general of barbarian descent who ruled the western Roman Empire by emperors whom he set up and put down at will. He dethroned Avitus in 456, and appointed Majorianus emperor, whom he caused to be assassinated in 461. He then placed Livius Severus on the throne, and on his death in 465 he carried on the government for some time alone. In 467 Arthemius was put on the throne, and gave his daughter in marriage to Ricimer. The latter soon took up arms against his father-in-law, who was assassinated in 472. Ricimer died soon after.

Ric'inus. See *Castor-oil.*

Rickets (rik'ets), a disease peculiar to infancy, chiefly characterized by changes in the texture, chemical composition, and outward form of the bony skeleton, and by altered functions of the other organs, transient for the most part, but occasionally permanent. The chief external features are the legs bent outward, chest unduly projecting, head large and forehead projecting, spine

often curved, joints large and prominent, general form stunted, etc. Rickets is chiefly a disease of large cities, and its development is favored by want of nourishing food, overcrowding, and neglect of sanitary and hygienic precautions generally. In the treatment of rickets all means are employed by which the system is invigorated, including good food, fresh air, and exercise. The use of splints for the legs is often beneficial, and as the child grows up nature often remedies the worst features.

Ricochet Firing (rik'u-shā, or shet), the firing of guns, mortars, or howitzers with small charges and low elevation, so as to cause the balls or shells to bound along. It is very destructive, and is frequently used in sieges to clear the face of a ravelin, bastion, or other work, dismounting guns and scattering men; and may also be used against troops in the field.

Rideau Canal (ri-dō'), a Canadian canal constructed between Kingston on Lake Ontario and Ottawa as a through waterway by means of the river Ottawa to Montreal, the St. Lawrence route being interrupted by rapids. Canals have since been built along the St. Lawrence to avoid these, and the Rideau is now little used.

Ridgefield Park, a residential village of Bergen Co., New Jersey, 8 miles N. of New York. Pop. 8575.

Ridgewood, a village in Bergen Co., New Jersey, 22 miles from New York, and 5 miles N. E. of Paterson. Pop. 7620.

Ridgway, borough, county seat of Elk Co., Pennsylvania, 118 miles S. E. of Erie. Machinery, dynamos, edge-tools, leather, etc., are manufactured. Pop. (1920) 6037.

Riding (rīd'ing) is the art of sitting on horseback with firmness, ease, and gracefulness, and of guiding the horse and keeping him under perfect command. Walking, trotting, and galloping are the three natural paces of the horse, but these may be converted into artificial paces by art and skill, by shortening or quickening the motion of the horse. The position of a rider should be upright in the saddle; the legs and thighs should be turned in easily, so that the fore part of the inside of the knees may press and grasp the saddle, and the legs hang down easily and naturally, the feet being parallel to the horse's sides, neither turned in nor out, only that the toes should be kept a little higher than the heels. The hand holding the reins is generally kept clear of the body, and immediately over the pummel of the saddle. A firm and well-kept balanced position of the body is of the utmost consequence, as it affects the horse in every motion, and the hands and legs ought to act in correspondence with each other in everything, the latter being always subservient to the former. The art of riding is not difficult of attainment, but it is one which can only be mastered by practical instruction and constant practice.

Ridings (rīd'ings), the three jurisdictions into which the English county of York is divided on account of its extent. They are called the North, East, and West Ridings.

Ridley (rid'li), NICHOLAS, Bishop of London in the reigns of Edward VI, and his successor Mary, was born about the commencement of the sixteenth century, and educated at Cambridge. He afterwards traveled on the continent for three years, and on his return filled the office of proctor to Cambridge University. In 1547 he was chosen to the see of Rochester, and in 1550 superseded Bonner as Bishop of London. On the death of Edward he was involved in an attempt to secure the Protestant ascendency by placing the Lady Jane Grey upon the throne. This, together with his connection with Cranmer, led to his being tried for heresy, and after a formal disputation on the controverted points with a deputation of Roman Catholic bishops he was condemned to the stake. This sentence he underwent with the greatest fortitude, in company with his friend and fellow-sufferer Latimer, Oct. 16, 1555, in Oxford.

Ridpath (rīd'path), JOHN CLARK, historian, born in Putnam Co., Indiana, in 1840; died Aug. 1, 1900. He became professor of English literature in Asbury University, Ind., in 1867 and its vice-president in 1879. He published a *History of the United States* in 1875, a *Cyclopedia of Universal History*, 1880-84, and *Great Races of Mankind*, 1894.

Riel, LOUIS, a Canadian revolutionist, born at Boniface, Manitoba, in 1844, son of a half-breed Indian. He became a leader of revolts against the English, was elected to the Dominion parliament, but not allowed to take his seat, and after this twice organized rebellions among the Indians and western settlers. He was taken prisoner in 1880, tried for treason and executed.

Rienzi (rē-en'zē), COLA DI, a native of Rome, born about 1312. He was the son of a tavern-keeper, acquired a good education, and early dis-

tinguished himself by his talents, and especially by his attacks on the tyranny of the nobles. In 1342 he endeavored to induce Pope Clement VI, then at Avignon, to initiate reforms, but nothing was done. In 1347, during the absence of the governor of Rome, Stefano Colonna, Rienzi summoned a secret assembly of his friends upon Mount Aventine, and induced them all to subscribe an oath for the establishment of a plan of government which he called the 'good estate.' The people conferred upon him the title of tribune, with all the attributes of sovereignty. He banished several noble families, and compelled Colonna to quit Rome. His strict regard to justice and the public good in the first exercise of his power induced even the pope to countenance him. But he subsequently became ambitious and haughty, and finding he had lost the confidence of the people he withdrew from Rome in 1348. He returned secretly to Rome in 1350, but was discovered, and fell into the hands of Pope Clement at Avignon, who imprisoned him for three years. Innocent VI released Rienzi, and sent him to Rome to oppose another popular demagogue named Boroncelli. But after a turbulent administration of a few months he was killed in 1354.

Riesa (rē'zȧ), a town in Saxony, on the left bank of the Elbe. It has a large river trade and various industries. Pop. (1905) 14,073.

Riesengebirge (rē'zen-gė-bir-gė; Giants' Mountains), a mountain range of Europe, separating Silesia from Bohemia and Moravia, till it joins the Carpathians; but the name is properly applied to that part of this range which lies between the sources of the Neisse and the Bober. It contains the loftiest mountains of the north or central parts of Germany, the Schneekoppe being 5257 feet high. The geological structure of the range consists of granite, gneiss, and mica slate, and in the valleys there are coal and basaltic strata.

Riesi (rē-ā'sē), a town in Sicily, province of Caltanissetta. It has large sulphur mines, and the olive and vine are here extensively cultivated. Pop. 11,914.

Riet-bok (rēt-bok), the Dutch name for an antelope of South Africa, which lives in reedy marshes (*Eleotrăgus arundinaceus*). Called also *Reed-buck*.

Rieti (rē-ā'tē), a town in Italy, in the province of Perugia, 42 miles N. N. E. of Rome. It is the see of a bishop, has an imposing cathedral, and manufactures of silk and woolen stuffs, etc. Pop. 9845.

Riff, or El Rif (rēf), a district on the north coast of Morocco, long the home of pirates, who gave great trouble to the European powers by their depredations in the Mediterranean.

Rifle (rī'fl), a portable firearm, the interior surface of the barrel of which is grooved, the channels being cut in the form of a screw. The number of these spiral channels or threads, as well as their depth, varies in different rifles, the most approved form being with the channels and ridges of equal breadth, and the spiral turning more quickly as it nears the muzzle. The bullet fired is now always of an elongated form. The great advantage gained by a weapon of this construction is that the bullet discharged from the piece, by having a rotatory action imparted to its axis coincident with its line of flight, is preserved in its direct path without being subject to the aberrations that injure precision of aim in firing with unrifled arms. As a necessary consequence of the projectile being carried more directly in its line of aim, its length of range, as well as its certainty in hitting the object, is materially increased. Rifles were invented in Germany in 1498, and have been used as military weapons since 1631, but were not used in the British army until the latter half of the eighteenth century; and till 1851 the British infantry, with the exception of those regiments known as rifle corps, was universally armed with the smooth-bore musket. In 1851 the first rifle firing an elongated bullet came in under the name of the Minié. After this date came the general adoption of the breech-loading rifle, the reduction in bore and weight of weapon, and subsequently the development of magazine rifles, now commonly in use in all armies. In the United States the Springfield rifle was the army weapon from 1873 to 1892, when it was replaced by a Scandinavian magazine rifle, the Krag-Jorgensen. In 1902 the Springfield, now converted into a magazine rifle, was adopted as the army weapon. In ordinary use the Winchester has long been a favorite. In European armies various weapons are in use. In Britain the Martini-Henry was adopted in 1869; now replaced by the Lee-Metford weapon. In Europe the Mauser is the weapon in use in several countries; the Chassepot, Krag-Jorgensen, etc., in others. This class of magazine rifle is being replaced in some countries by one which acts automatically, ejecting the empty shell

and bringing forward another cartridge by the force of the discharge. These will fire 300 bullets per minute, but their weight and complexity and the waste of ammunition in this rapid scattering of bullets are objections to their use. Since 1906 a new sharp-pointed bullet has been adopted in the United States and several other countries.

The repeating rifle is a development of a very old type of weapon. In the Spencer, the first used with signal success, the cartridges are placed in the stock of the arm; in the Winchester, the best known of repeating rifles, they are in a tube underneath the barrel. More modern military magazine rifles draw their supply of cartridges from a reserve contained in a detachable magazine, the advantage being the greater efficiency of the weapon as a single loader. The Lebel rifles, originally furnished with a tubular magazine, are now being converted to the more modern type. The breech mechanism usually preferred is that upon the 'door-bolt' principle, of which the Chassepot and Prussian needle-gun are well-known types; the Winchester is one of the few actuated by an under lever, and the Colt is worked by a sliding boss placed under the barrel. In the Mannlicher the bolt is drawn back simply; in others it has to be turned to the left before it can be withdrawn. With the Lebel the breech-bolt has two projections, which, when the bolt is turned, securely lock the bolt close to the base of the cartridge; in the Enfield-Lee, a similar double-locking arrangement is placed where the projecting knob to actuate the mechanism joins the breech-bolt. The magazine of the Enfield-Lee, containing eight cartridges, is placed under the stock behind the barrel, to the level of which a spiral spring in the magazine raises the cartridges. The breech-bolt, which contains the firing mechanism and extractor, when pushed forward forces the raised cartridge into the barrel. The magazine is detached by pressing a 'catch,' or blocked by a 'cut-off,' when the rifle may be used as a single loader.

When Whitworth produced his hexagonal bore rifle of .450 caliber, it was thought that the bullet was of insufficient diameter, and the .577 was adopted in its stead; later, after twenty years' experience with the .450 Martini-Henry, the bore has been still further reduced, chiefly owing to the discoveries of Hebler, whose Swiss rifle of 7½ millimeters was found to give increased velocity, greater range, equal accuracy, and at the same time permitted of lighter ammunition being used. The bullet is coated with thin steel, ferro-nickel or other hard metal, so that it shall not strip in the rifling, which has a sharp twist, one complete turn in less than 12 inches, and leaves the muzzle at a velocity of 2000 or more feet per second, thus giving an extreme range of 3500 yards. Improved explosives, almost smokeless and which do not foul the barrel, have added to the success of the small-bore rifle. Sporting rifles have a shorter range and inferior velocity to the best military ones.

The Mauser is a magazine rifle in which the cartridge-holder or clip consists merely of a strip of metal curved at its edges to enfold the flanged heads of the cartridges. The magazine is placed centrally under the receiver and shells are forced from the clip into the magazine from above. The breech mechanism has the ordinary sliding and turning bolts for the operation of charging the rifle. The bore is 0.256 in. A charge of 30 grains of smokeless powder ejects a bullet of 220 grains with deadly force to over 1000 yards. The bullet is a lead slug jacketed with a thin cover of steel, the length being about 3 calibers.

Until the advent of the 1903 Springfield the German Mauser occupied the summit of military-rifle supremacy. From 1903 until the advent of the World War these two rifles, the Mauser and the Springfield, were easily the two leaders. The British army had been equipped with the Lee-Enfield for some years prior to the war, but the British ordnance authorities had been making vigorous efforts to improve this weapon. The Enfield was at a disadvantage principally in its ammunition. It fired a .303-caliber cartridge with a rimmed head. From a ballistic standpoint this cartridge was virtually obsolete. In 1914 a new, improved Enfield, known as the Pattern '14, was brought out in England, and the British government was on the point of adopting it when the war broke out. This was to be a gun of .276 caliber and was to shoot rimless, or cannelured, cartridges similar to the standard United States ammunition. The war upset the project for the improved Enfield. British arsenals and munition factories were equipped to turn out in the quantities demanded by the war only the old 'short Enfield.' England was obliged to turn to outside sources for an additional rifle supply, and in the United States she found several firms willing to undertake large rifle contracts, notably the Winchester Repeating Arms Co., of New Haven, Conn.; the Remington Arms-Union Metallic Cartridge Co., of Ilion, N. Y.; and the Remington Arms Co., of Delaware, at its

enormous war-contract factory at Eddystone, Pa., later a part of the Midvale Steel & Ordnance Co. Since the American plants had to be built up, the British selected the improved Enfield for the American manufacture, but modified it to receive the .303 rimmed cartridges.

When the United States entered the war the American service rifle, the Springfield, the closest shooting military rifle known in its day, had to be temporarily abandoned. The Model 1903 Springfield rifle had been built in two factories, and only two—the Springfield Armory, Springfield, Mass., and the Rock Island Arsenal at Rock Island, Ill. The government for several years prior to 1917 had cut down its expenditures for the manufacture of small arms and ammunition. The result was that the Rock Island Arsenal had ceased its production of Springfields altogether, while the output of rifles from the Springfield Armory had been greatly reduced. The Ordnance Department determined, when America entered the war, to speed up the production of Springfields, but also to utilize the Enfield, which could be produced in great quantities at the plants at New Haven, Ilion and Eddystone. The Enfield had many of the characteristics of the 1903 Springfield, but it was not as good as the Springfield in its proportions, and its sights lacked some of the refinements to which Americans were accustomed. Yet even so it was a superior weapon to either the French or Russian rifle. The rifle had been designed originally for rimless ammunition and later modified; so it was not a difficult thing to modify it back again to shoot the American standard .30-caliber Springfield cartridges.

Thus the modified Enfield was the rifle on which the American Expeditionary Forces based their chief dependence. With its modified firing mechanism it could use the superior Springfield cartridges with their great accuracy. The Enfield sights, by having the peep sight close to the eye of the firer, gave even greater quickness of aim than the Springfield sights afforded. In this respect the weapon was far superior to the Mauser, which was the main dependence of the German army. The production of Enfields and Springfields during the war up to November 9, 1918, amounted to a total of 2,506,307 guns. Of these 312,878 were Springfield rifles produced by the two government arsenals. In spite of the time that went into the standardization of the Enfield rifle all troops leaving the United States were armed with American weapons at the ports of embarkation.

After the war comparisons were made between the Mauser rifles used by the Germans and the American Springfield rifles and modified Enfields. The American rifles showed a marked superiority in the rapidity of fire, the quickness and ease of sighting, and in the accuracy of shots fired. The accuracy was due not only to the standard Springfield ammunition, but also to the greater mechanical accuracy in the finish of the chamber and bore of the American rifles. The rapidity of fire of the American guns was due to the position and shape of the bolt handle, which is the movable mechanism on the rifle with which the soldier ejects a spent shell and throws in a fresh one. The original bolt handle of the Springfield, like the Mauser, projected horizontally from the side of the chamber. The rifle designers later bent the bolt handle down and back. The Enfield design carried this development even farther, so that the bolt handle was practically right at the trigger, and the rifleman's hand was ready to pull the trigger the instant after it had thrown in a new cartridge, thus greatly increasing the rate of shooting. (See also *Machine Guns.*)

Riga (rē'gȧ), a seaport of Europe, capital of the new republic of Latvia, on both sides of the Duna, or Dwina, about 5 miles above its mouth in the Gulf of Riga. It is situated on a sandy flat, and in the older parts consists of narrow, winding streets, huddled together, while the more modern parts are much better built. The river is crossed by a bridge of boats, and on both sides are spacious quays, which afford excellent promenades. The public buildings are numerous, but few of them are deserving of particular notice, except the cathedral, a Gothic building of the thirteenth and sixteenth centuries, St. Peter's Church, the castle or governor's residence, and the town-hall. The manufactures are not of great importance, but the trade is very extensive, the principal exports being flax, hemp, timber, linseed, grain, etc. Ships can come up to the town, or they may unload and take cargo in at Dünamünde, the port and fortress at the mouth of the river. Half of the trade is with Britain. The population is about 500,000. Prior to the war nearly half the inhabitants were Germans and Riga's wealth was for the most part in German hands. Since then the Letts have taken control of business.

In the winter campaign of 1915 in the European war the Germans almost forced their way to Riga, but were halted by the stout resistance of the Russian troops. The seaport fell to the Germans two years later following the revolution. On August

22, 1917, the Germans began the advance from Kemmera, between the Gulf of Riga and the River Aa with 260,000 men, who were opposed by 60,000 Russians under General Letchitsky. The Germans were superior also in artillery. The Russians fought bravely, but were obliged to retire. The town was evacuated August 23, and the German troops, crossing the Dwina near Uxul, 16 miles southeast of the city, advanced up the Riga-Mitau causeway and entered Riga September 2. In the peace treaty imposed upon Russia by Germany, March, 1918, Riga was to be occupied by a German police force until order was restored. With the collapse of Germany in November, 1918, Riga established itself as the capital of the 'Free State of Latvia' (q. v.). It was formerly in Russia and occupied third rank among the Russian seaports. Of the Baltic seaports it ranks next to Petrograd.

Riga, or LIVONIA, GULF OF, a gulf of the Baltic, which washes the coasts of Courland, Livonia, and Esthonia, and contracts in the west to a comparatively narrow entrance, the island of Osel almost closing it on the northwest. The chief river which it receives is the South Dwina.

Right, PETITION OF. See *Petition of Right.*

Right Ascension. See *Ascension.*

Right of Way, the right of passing over land not one's own. Rights of this kind are public if enjoyed by everybody; private, if enjoyed by a certain person or class of persons. Wherever there is a public right of way, there is a highway. The origin of a highway is generally said to be in a dedication thereof by an owner to the public; and such dedication may be expressed or implied. It will be implied from the use of the highway by the public for a moderate number of years. But a highway may also be established by act of legislature. A private right of way may be grounded on a special permission, as where the owner grants to another the liberty of passing over his land.

Rights, BILL AND DECLARATION OF. See *Bill.*

Rights of Man, a theoretical declaration passed by the French National Assembly in August, 1789. It was attacked by Edmund Burke in his *Reflections on the French Revolution.* Thomas Paine vigorously replied to Burke in his *Rights of Man.* See *Paine, Thomas.*

Rigi (rē'gē), an isolated mountain of Switzerland, on the borders of the cantons of Lucerne and Schwyz, between Lakes Zug and Lucerne, 5905 feet high. It affords one of the finest views in Switzerland, and is annually visited by numerous travelers. Two railways have been constructed to reach its summit (Rigi-Kulm) from opposite sides. They are on the 'rack-and-pinion' principle, there being a central toothed rail into which works a toothed wheel under the locomotive. Hotels and similar establishments are numerous on the Rigi.

Rigor Mortis (rig'ur mōr'tis), the rigidity of limbs that follows death. It is one of the signs of cessation of life.

Rig-Veda (rig-vē'da), the first and principal of the Vedas or sacred hymns of the Hindus. See *Vedas.*

Riis (rēs), JACOB AUGUST, an American author and social worker, born at Ribe, Denmark, May 3, 1849; died at Barre, Mass., May 26, 1914. Coming to the United States in 1869, he became a reporter on the New York Sun. His book, *How the Other Half Lives*, created a sensation in philanthropic circles and did much to bring about tenement-house reform. He formed a lasting friendship with Theodore Roosevelt when the latter was police commissioner of New York. He also wrote *The Children of the Poor, Out of Mulberry Street, The Making of an American*, an autobiography; *Theodore Roosevelt, the Citizen*, etc.

Riley (rī'li), JAMES WHITCOMB, an American dialect poet, born at Greenfield, Ind., Oct. 7, 1853; died at Indianapolis, Ind., July 22, 1916. He became a sign painter, afterward a strolling player, and then a newspaper man. His verses first began to appear in the Indianapolis *Journal*, and were written in the Hoosier dialect. He was recognized as America's supreme poet of childhood and home life, writing such appealing poems as *The Old Swimmin' Hole, Raggedy Man, An Old Sweetheart of Mine, Orphant Annie*, and many others.

Rimini (rē'me-nē; anciently *Ariminum*), a town of N. Italy, in the province of Forli, on the shore of the Adriatic, with the torrent Ausa on the east and the river Marecchia on the west. It has a cathedral, built in the 14th but remodeled in the 15th century; the triumphal arch of Augustus; and the bridge of Augustus over the Marecchia, built of white marble. Salt refining, silk spinning, and the manufacture of glass and rope are among the chief industries. The harbor has silted up so as to admit only small vessels. Pop. 30,000.

Rimsky-Korsakof (rim'skē-kor'sä-kof), NICHOLAS ANDREIVITCH (1844-1908), a celebrated Russian composer of opera, orchestra music, songs, etc; born at Tikhvin, Novgorod; died at Petrograd. He wrote a number of operas, including *The Snow Maiden*, *Mozart and Salieri*, *Kites*, etc., and three symphonies, as well as symphonic poems, overtures and songs. His *Song of India*, *Snowflakes*, and *Hymn to the Sun* are among his most popular songs.

Rimu (rē'mū), a New Zealand tree (*Dacrydium cupressinum*) of the yew family. It grows to a height of 80 to 100 feet, and from 2 to 6 feet in diameter. Its wood is valued for general building purposes.

Rinderpest (rin'dĕr-pest; German name), or CATTLE-PLAGUE, a contagious disease which attacks animals of the ox family, and is attended with the most deadly results. The disease appears to be identical with what was formerly known as murrain, and is sometimes called the steppe-murrain, from the Russian steppes, which are its habitat. This disease has caused great havoc among cattle for at least a thousand years, spreading occasionally like a pestilence over Europe. In 1865-67 there was a very serious visitation of it. The treatment of the disease having proved a failure, the policy of 'stamping-out' or killing all infected animals was adopted. During this outbreak between 200,000 and 300,000 cattle died of the plague in Britain, or were ordered to be killed on account of it. In 1896 a serious epidemic broke out in Africa, and spread with great rapidity, reaching South Africa by the end of the year and destroying thousands of antelopes and other wild animals in addition to cattle. The probable cause of the disease is a micro-organism which is found in the blood and all the discharges of the infected animals, and is capable of being transmitted indirectly by any of these to great distances. Sheep and other animals can be affected by the disease, but in a less intense form. The period of incubation varies from two to ten days. The symptoms are elevation of the temperature of the body, followed by a heightened color of the mucous membrane of the mouth, and granular, yellowish eruptions on the gums, lips, tongue, palate, and cheeks.

Ring, an ornament for the fingers which has been worn from the most ancient period of civilization. Among the ancient nations who are known to have attached special importance to the wearing of rings were the Assyrians, Egyptians, Hebrews, Greeks, and Romans. The nose, ears, arms, and even the legs and toes have also, among various people, been decorated with them. Rings have also from a very early period been reckoned as symbols of authority, which could be delegated by merely delivering the ring to an agent; they were also used as symbols of subjection. The earliest mention of rings is in the book of Genesis, and relates to the Hebrews. Among the Egyptians rings of gold were worn in great profusion. The common people wore porcelain rings. The Greeks and Romans used them for sealing contracts, closing coffers, etc. The modern use of wedding rings was probably derived from the Jews. A ring appears from an early period to have been one of the insignia of a bishop. Doctors were formerly expected to wear a ring on the third finger of the right hand.

Ringbone, an exostosis or bony tumor mostly met with on the coronet of overworked horses, but sometimes seen on colts, or even newly-dropped foals. Ringbone is practically incurable.

Ring-dotterel (*Charadrius hiaticula*), a species of plover pretty common in Britain, where it frequents the shores of bays or inlets of the sea and rivers, feeding on worms, insects, small crustacea, etc. It has its name from a white ring round the neck.

Ring-dove, or CUSHAT (*Columba palumbus*), the largest of the pigeons inhabiting Europe, occurring very generally throughout the wooded parts of the continent. It is migratory in countries in which the severe winters preclude the possibility of its obtaining a due supply of food, and appears on the approach of winter to assemble in flocks, and to perform a limited migration, probably in search of food. A bluish-gray color prevails generally over the head, cheeks, neck, back, and rump, while the breast and under parts of the neck are of a purplish red, the belly and thighs dull white. A patch of white on either side of the neck forms a sort of ring or collar. The average length is about 16 or 17 inches. The food of the ring-dove consists of grain, acorns, berries, the leaves and tops of turnips, etc. The nests are composed of sticks and twigs loosely placed together. The birds are wary and shy, and rarely breed in confinement.

Ringed Snake, a harmless colubrine snake (*Tropidonōtus* or *Coluber natrix*), with teeth so small as to be incapable of piercing the skin. It is common in England. It feeds on

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THE HARBOR OF RIO DE JANEIRO

frogs, mice, young birds, etc., which it swallows alive. It is torpid during winter. It is very fond of water and is an excellent swimmer, sometimes diving with great ease and remaining below the surface for a considerable length of time, and swimming for astonishingly long distances.

Ring-money, a form of currency consisting of rings, which seems to have originated with the Egyptians. It is still used in parts of Africa, and is manufactured in Birmingham for the use of African traders. A similar form of money was found by Cæsar among the Celts of Gaul, and appears also to have prevailed in Britain, as well as among the Scandinavian nations of Northern Europe.

Ring Ouzel. See *Ouzel.*

Ringworm, a parasitic disease caused by one or more of several kinds of fungi, usually one of the *hyphomycetes* or mould fungi. These have a predilection for the upper or horny layer of the skin, together with the hairs and hair-follicles. Ringworm may attack almost any part of the human body, but the hairy parts, such as the scalp, are the least amenable to treatment. Ordinarily cleanliness combined with the persistent application of some antiparasitic agent will suffice to bring about a cure. The agents commonly used are sulphur, oleate of mercury, chrysarobin, salicylic acid and pyrogallic acid, from one or more of which an ointment is made.

When the scalp is affected the ordinary methods are too slow and uncertain and are very likely to be abandoned by either patient or physician. The disease is not always the mild affair the older writers would have us believe; and as the hair follicles are the parts in which the infection is mainly found it becomes necessary to remove the hairs before there can be any possibility of a cure. In order to do this properly the patient requires the services of a physician or a nurse or other qualified attendant. The X-ray method, a very efficient means of cure, has been in steady use since 1904; and is a well-recognized agent in all modern hospitals and clinics and in all large and progressive centers of population. The action of X-ray is peculiar; it does not kill the parasite, but removes the hair, and during the process of depilation the parasite is removed with the hair. There are two methods in general use. In the one, the whole scalp is treated and the hair removed; in the other, only the part affected is treated. In cases treated by the X-rays the hair begins to fall out at the end of about two weeks, and the process of depilation is complete in another two weeks. Soon after all the hair has fallen out, the new hair starts to grow; the time varying in different persons. At the end of about three months the scalp is usually covered with a new crop of hair. The scalp must be kept thoroughly clean all through the treatment. The hair which falls out brings with it the follicle and the infecting fungi, both of which are capable of spreading the infection to other parts of the same person as well as other people. All the hairs in the area treated will fall out, whether they are healthy or diseased, and all are replaced by new hair.

Rinmann's Green, same as *cobalt-green.*

Riobamba (rē-ō-bäm′ba), or BOLIVAR, a town of Ecuador, 80 miles northeast of Guayaquil. Pop. 18,000, chiefly Indians.

Rio Branco. See *Branco.*

Rio Bravo, or RIO GRANDE DEL NORTE. See *Norte.*

Rio de Janeiro (rē′o de zhâ-nā′ro), the capital of the republic of Brazil, and the second largest city of South America, is most beautifully and advantageously situated on the southeastern coast, on a fine natural harbor formed by a bay of the same name. The city, which has a picturesque appearance from the bay, is built on flat ground along the shore or on the slopes of low hills. Upon nearer approach it is found that the houses are small and mean looking, the streets narrow and ill paved, especially in the older part, and that even the public buildings are without much architectural merit. The finest buildings are the opera-house, senate-house, military barracks, and the national museum, while the churches are chiefly notable for their gaudy interior decorations. A striking feature in the city is the aqueduct, which brings the water a distance of 12 miles and crosses a wide valley on a beautiful double-tier of granite arches. Among benevolent institutions are the Casa da Misericordia, several other hospitals, and a large lunatic asylum. There are two colleges, medical schools, a naval and military academy, numerous scientific establishments, public schools, national library, a botanical garden, and observatory. At Rio is the chief military arsenal of the republic, while on one of the islands in the bay there is a naval arsenal with docks and building yards. The bay has its entrance, 1700 yards wide, between Fort St. Juan and Fort Santa Cruz, and extends inwards 15 miles, with a width varying from 2 to 8 miles. It is diversified with numerous islands, surrounded

by hills covered by luxuriant tropical vegetation, and affords safe anchorage for the largest vessels. Manufactures are unimportant, but there is an extensive trade in coffee, sugar, hides, tobacco, timber, etc. The principal imports are linen, woolen, and cotton tissues; iron and steel goods, and provisions and preserved meats. The city is the central terminus of the railways of the country; tramways have also been worked for some time. The first settlement in the neighborhood of Rio de Janeiro was formed by some French refugees in 1555. A Portuguese force took possession of the settlement in 1567, and laid the foundations of a new city, which has grown into the present capital of Rio Janeiro. Pop. 1,128,632. —The state of Rio de Janeiro has an area of 26,660 sq. miles, and is decidedly mountainous in the center. It is the best-cultivated section of Brazil, the chief crop being coffee. Immense herds of cattle are reared, and the forests are rich in timber. Pop. 1,300,000.

Rio Grande, a river of West Africa, which enters the Atlantic by an estuary opposite the Bissagos Islands; upper course not well known.

Rio Grande del Norte (rē'ō grän'de del nor'tē), a river of the United States, rising in s. w. Colorado, crossing New Mexico, and from El Paso to the gulf forming the boundary between the United States and Mexico. Its length is estimated at 1800 miles, but it is generally shallow and obstructed by rapids and sandbanks. Its waters are much used for irrigation in New Mexico.

Rio Grande do Norte (dụ nōr'te; Grand River of the North), a maritime state in the northeast of Brazil; area 22,196 square miles. The surface is mountainous, and not generally fertile. Agriculture and cattle-rearing form the principal branches of industry. The capital is Natal or Rio Grande do Norte (pop. 10,000), a seaport at the mouth of the small river, Rio Grande do Norte, exporting some cotton, sugar, etc. Pop. estimated at 410.000.

Rio Grande do Sul (dụ söl), the most southern state of Brazil, bounded partly by the Atlantic, and bordering with Uruguay and the Argentine Republic, has an area of 91,336 sq. miles, and a pop. of about 1,500,000. It is well watered, contains much fertile land, and has a healthy climate. On the coast is the large lake or lagoon of Patos, besides others. The chief occupations of the inhabitants are cattle-rearing and agriculture. Among the population are 100,000 Germans, there being a number of flourishing German settlements. There are some 600 miles of railway. Hides, tallow, horse-hair, bones, etc., are exported.— Rio Grande, or São Pedro do Rio Grande, its former capital, is situated on a peninsula near where the Lake of Patos communicates with the Atlantic. Its houses are mostly of earth, and its streets unpaved. It has an active trade in hides, horse-hair, wool, tallow, etc. Pop. 19,000.

Rioja (rē-ō'*h*å), Francisco de, a Spanish lyric poet, born at Seville about 1600; died in 1659. He became assessor of the supreme tribunal of the Inquisition. As a poet he followed classic and Italian models, and his poems exhibit purity and grace of diction, deep feeling, and a vigorous imagination.

Rioja (rē-ō'*h*å), La, one of the western provinces of the Argentine Republic. It is well watered on the west, but in the east and south there are salt and sand deserts. The climate is dry and healthy. The inhabitants are chiefly engaged in agriculture and cattle-rearing. Excellent wheat, wine, and fruits are produced. Pop. 82,099.— Chief town, La Rioja, at the foot of the Sierra Velasco, in the midst of vineyards and orange groves. Pop. 8000.

Riom (rē-ōn), a town of France, in the department of Puy-de-Dôme, 10 miles north of Clermont. The streets are spacious, but the houses, being built of dark lava, present a somewhat gloomy appearance. The chief manufactures are linen, silk, and hardware. Pop. 7839.

Rion. See *Phasis.*

Rio Negro (nē'grō; Spanish 'black river'), the name of numerous streams, of which two are important: — (1) A river of S. America, and principal tributary of the Amazon. It rises in Colombia, and joins the Amazon after a course of about 1000 miles at Manaos, Brazil. Through its affluent, the Cassiquiari, there is direct communication between the Amazon and Orinoco. See *Cassiquiari.* (2) A river of S. America forming the boundary between the Argentine Republic and Patagonia. It rises in the Andes in Chile, and is about 700 miles long. Its current is very rapid, and its bed obstructed with shoals and sand banks.

Rione'gro, a town in the S. American Republic of Colombia, prov. Antioquia, 12 miles s. w. of Medellin. Pop. 18.648.

Rionero in Volture (rē-ō-nā'rō ēn vōl-tö'rā), a town of South Italy, province of

Pottenza, at the foot of Mt. Volture. Pop. 11,383.

Rio Salado. See *Salado.*

Riot (rī'ut), a disturbance of the public peace, attended with circumstances of tumult and commotion, as where an assembly destroys, or in any manner damages, seizes, or invades private or public property, or does any injury whatever by actual or threatened violence to the persons of individuals. By the common law a riot is an unlawful assembly of three or more persons which has actually begun to execute the common purpose for which it assembled by a breach of the peace, and to the terror of the public. A lawful assembly may become a riot if the persons assembled form and proceed to execute an unlawful purpose to the terror of the people, although they had not that purpose when they assembled. The riot acts of England are not in force in the United States, but it is conceived that by the common law the authorities have power to suppress riotous assemblies and punish those participating in them.

Rio Téodoro, a river of Brazil, which flows into the Madeira River after a tortuous course of over 900 miles. It was explored by Theodore Roosevelt (q. v.) in 1914. Also called *The River of Doubt.*

Rio Tinto Mines, celebrated copper mines in the southwest of Spain, province of Huelva.

Riparian Rights. See *Rivers.*

Ripley (rip'li), GEORGE, editor, was born at Greenfield, Massachusetts, 1802; died July 4, 1880. He was educated at Harvard College and Cambridge Divinity School, became a Unitarian minister in Boston, lived some years in Europe, and was one of the founders of the *Transcendental* magazine, the *Dial* (on which he had Emerson and Margaret Fuller as coadjutors), and the originator and conductor of the communistic experiment at Brook Farm. He became literary editor of the *New York Tribune* in 1849, and was joint editor with C. A. Dana of the *American Cyclopædia* (1858–63, 16 vols.; also of the second edition).

Ripon (rip'un), a cathedral city, formerly a parliamentary borough of England, county of York (West Riding), on the Ure, 22 miles N. N. W. of York. It has a spacious marketplace and an elegant town-hall. The cathedral dates from the latter half of the twelfth century, and is partly Early English, partly decorated in architecture, with two towers, each 110 feet high. It was recently thoroughly restored, and is one of the finest churches in England. The other buildings include a free grammar-school (founded by Queen Mary), an infirmary, and a mechanics' institution. Pop. (1911) 8218.

Riposto (rē-pōs'tō), a seaport in the east of Sicily, prov. Catania, with a trade in wine, oil, etc. Pop. 7238.

Ripple-marks, the wavy or ridgy marks left on the beach of a sea, lake, or river by the ripples or wavelets. Such marks have often been preserved when the sand has hardened into rock, and are held by geologists as indications that deposition of the beds in which they occur took place on the seashore or at a depth not greater than 60 feet. We have also wind ripple-marks and current ripple-marks, and it requires much discrimination to determine the producing cause.

Rishis (rish'ēs), certain sages of the Hindu mythology, sprung from the mind of Brahma. Seven of them are enumerated. The term afterwards came to be applied to all personages distinguished for piety and wisdom.

Rissole (ris'ol), in cookery, an entrée consisting of meat or fish mixed with bread-crumbs and yolk of eggs, all wrapped in a fine paste, so as to resemble a sausage, and fried.

Ristori (rēs-tō're), ADELAIDE, an Italian actress, born in 1822. At a very early age she played in comedy, but afterwards appeared in tragedy. She married the Marquis Capranica del Grillo in 1847, and afterwards played in all the chief European capitals. She took her farewell of the English stage in Manchester, November 8, 1873. Among her chief characters were *Medea, Francesca da Rimini, Marie Antoinette, Mary Stuart,* and *Lady Macbeth.* She died October 9, 1906.

Ritchie (rich'i), ANNA CORA MOWATT, actor and author, born of American parents at Bordeaux, France, in 1819; died in 1870. She became a favorite actress on the American stage, and wrote *Pelayo,* a poem; *Fashion,* a comedy, and *Armand,* a drama.

Ritornello (rē-tor-nel'lō; Italian), in music, a short repetition as of the concluding phrases of an air; or a passage which is played while the principal voice pauses; or it often signifies the introduction to an air or any musical piece. Ritornelli are also Italian popular songs in stanzas of three lines each. The meter and number of the syliables are not subject to rule. The first line, however, is generally the shortest.

Ritschl (richl), Friedrich Wilhelm, a German classical scholar, born in 1806. After attending the gymnasiums at Erfurt and Wittenberg he went to Leipzig and Halle, where he devoted himself to classical studies. In 1832 he was appointed extraordinary professor at Halle University. He subsequently held professorships at Breslau and Bonn, and in 1865 accepted a call to Leipzig University, where he remained until his death in 1876. His chief work is a critical edition of *Plautus' Comedies* (1848-54). His other works include *Parerga Plautina and Terentiana*, and *Priscæ Latinitatis Monumenta Epigraphica*. He also contributed largely to philological journals. He died Nov. 9, 1876.

Ritson (rit'sun), Joseph, an English literary antiquarian, born in 1752; died in 1803. He became a conveyancer in London and deputy high bailiff to the Duchy of Lancaster, and edited many old and rare books. He was noted for his industry and integrity, but was a quarrelsome critic. His chief works are: *A Select Collection of English Songs* (1783), *Ancient Songs from the Time of King Henry II to the Revolution* (1790), a *Collection of Scottish Songs* (1794), *Robin Hood Poems* (1795), *Ancient English Metrical Romances* (1802), etc.

Rittenhouse (rit'en-hous), David, astronomer, born at Germantown, Pennsylvania, April 8, 1732; died in June, 1796. He learned the art of clockmaking, and worked at it while engaged in astronomical study. He subsequently engaged in making mathematical instruments, constructed an orrery, and observed the transit of Venus in 1769. He was elected treasurer of Pennsylvania in 1777, and in 1792 became the first director of the mint; was also employed in determining the boundaries of the State. He became president of the Philosophical Society in 1791 and a fellow of the Royal Society of London in 1795. He published many scientific papers in the *Transactions* of the American Philosophical Society.

Ritter (rit'ėr), Heinrich, a German philosopher, born in 1791, studied theology and philosophy at Halle, Göttingen, and Berlin from 1811 to 1815. In 1824 he became an extraordinary professor of philosophy in Berlin, accepted an ordinary professorship at Kiel in 1833, and subsequently occupied the chair of philosophy at Göttingen University from 1837 till his death in 1869. Ritter's chief work is a general *History of Philosophy*. He also published a *System of Logic and Metaphysics*; a *Cyclopædia of the Philosophical Sciences*; a popular *Treatise on Immortality*, and other works.

Ritter, Karl, a German geographer, born in 1779; died in 1859. He studied at Halle, became a private tutor in 1798, and in 1819 succeeded Schlosser as professor of history at the Frankfort Gymnasium. He then published an *Introduction to the History of European Nations before Herodotus*, 1820; and in the same year became professor extraordinary of geography at the University of Berlin, where he remained until his death. His great work is *Die Erdkunde im Verhältnisse zur Natur und Geschichte des Menschen* ('Geography in its Relations to Nature and History'), the first two volumes of which appeared in 1817-18, but it ultimately comprised upwards of twenty volumes. He wrote several other geographical works, and contributed extensively to the journals of the Berlin Geographical Society.

Ritual (rit'ū-al), the series of rites or ceremonies established in connection with any religion; or the book in which religious services are prescribed and detailed. See *Liturgy*.

Ritualism (rit'ū-al-izm), a strict adherence to rites and ceremonies in public worship. The term is more especially applied to a tendency recently manifested in the Church of England, resulting in a series of changes introduced by various clergymen of the High Church party into the services of the church. These changes may be described externally as generally in the direction of a more ornate worship, and as to their spirit or animating principle, as the infusion into outward forms of a larger measure of the symbolic element. They are defended on the grounds of law, ancient custom, inherent propriety, and divine sanction or authority. The Ritualists hold, with most others, that all authoritative and obligatory regulation upon ritual is not laid down in the New Testament, but they, or many of them, maintain that a knowledge of what is obligatory in ritual is derived from apostolical tradition, going back to apostolical times. They argue that the design of the institution of Christianity was not to abrogate the external ceremonials by which the patriarchal and Mosaic dispensations in the Old Testament were distinguished; but to replace them by a higher ceremonial, and they explain the comparative simplicity of primitive worship by the secrecy and restraint to which the early church was subjected. The points of ritual about which there has been the most violent

contention are those which involve the adoration of Christ as present on the altar under the forms of bread and wine. Other points are: the eastward position of the priest at consecration; lights on the holy table; the use of various vestments; the use of incense; mixing water with wine for communion; fasting before communion from previous midnight; regular confession to a priest, with absolution and penance; etc. The legal position of the Ritualists is that the first Book of Common Prayer, issued in the second year of Edward VI (1549, with alterations made in 1552, 1604, and 1662), is still the guide of the church in all matters pertaining to ritual, the present Prayer-book not being in itself complete, but referring to this first Prayer-book in its opening rubric. Various judgments have been given in ecclesiastical courts against extreme Ritualists, and some of their proceedings have been pronounced illegal. Ritualistic practices have been generally condemned by the bishops, and an act of parliament giving them power to restrain innovations of this kind came into force on July 1, 1875. The ritualistic movement in the Church of England arose out of the high church movement inaugurated by the Tractarians. See *Tractarianism.*

Rive-de-Gier (rēv-dė-zhyā), or simply RIVE, a town of France, department of the Loire, 25 miles E. S. E. of Montbrison, on the Gier. The coal-field which surrounds the town is now almost worked out. There are glass-works, spinning and other mills, foundries, machine and iron works, etc. Pop. 15,663.

River-crab, a name given to a genus of crabs (*Thelphusa*), inhabiting fresh water, and having the carapace quadrilateral and the antennæ very short. One species (*T. depressa*) inhabits muddy lakes and slow rivers in the south of Europe.

River of Doubt. See *Rio Téodoro.*

River Rouge (rözh), a village of Wayne Co., Michigan, 6 miles S. of Detroit, on 2 railroads. It has steel and bridge works and other industries. Pop. (1920) 9822.

Rivers (riv'ėrs) rank high in importance among the natural features of the globe, and are intimately connected with the history and condition of mankind. They have always formed important highways of communication, and the great cities built upon their banks have constituted in all ages the seats of empire. Every circumstance concerning rivers is therefore of importance, as their source, length of channel, outlet, rapidity of current, depth, and consequent capability of navigation. The source of a river is either a spring or springs, or a lake, or the river takes its origin from the melting of the snow and ice on mountains. The termination of a river is usually in the sea, a lake, or another river, or it may lose itself in the sand. All the streams which ultimately gather into one river form a *river system*, and the region which is drained by such a system of streams is called a *river basin.* River basins are usually separated from each other by more or less elevated ground, and the line of greatest elevation between them is called a *watershed.* In speaking of the *right* and *left* bank of a river we are always supposed to have the position of a person looking in the direction towards its mouth. The volume of water which rivers contain varies with many conditions, dependent upon the nature of the sources by which they are fed and the amount of rainfall throughout their course. The periodical melting of the snows adds greatly, in some cases, to the volume of rivers which have their origin in mountain regions; the rainy season in tropical regions has a similar effect (as in the case of the Nile), often causing extensive inundations. In arid countries the so-called rivers are often mere surface torrents, dependent on the rains, and exhibiting merely the dry beds of water-courses during the season of drought. The 'creeks' of Australia and the 'wadies' of the Arabian Desert are of this character. The average fall of a river's bed is indicated by the difference between the altitudes of its source and its outlet compared with its length of channel. The fall of many great rivers is much less than might be supposed. The Amazon has a fall of only 12 inches in the last 700 miles of its course. The Volga, which rises at an elevation of 633 feet above the Caspian Sea, has an average inclination of less than 4 inches to the mile throughout its course of more than 2000 miles. The Aberdeenshire river Dee, which rises at a height of 4060 feet, has a course of only 87 miles to its outlet, showing an average declivity of 46 feet per mile. Many rivers carry down immense quantities of earthy matter, which accumulates at their mouths, forming what is called a *delta* (which see). Among the great rivers of the world are the Mississippi—Missouri (4200 miles) and the Amazon (3900 miles), in America; the Yang-tse-Kiang, the Amoor, the Yenisei, the Indus, and Ganges in Asia, all over 1500

miles in length; the Congo (3000 miles), the Niger (2600 miles), and the Nile (4200 miles), in Africa; and the Danube (1670 miles), Volga (2200 miles), and Rhine (800 miles), in Europe.

By English and other law navigable rivers are held to be the property of the state (so far as navigation extends); non-navigable rivers belong to the proprietors through whose grounds they flow. The state has thus control and jurisdiction of the shores of navigable streams, while in the case of a non-navigable stream the proprietors of estates on opposite banks of it are supposed to own the ground over which it flows respectively to the center of its bed, and may fish it accordingly. They do not own the water, the property in which is shared by the owners above and below. A particular proprietor cannot dam up or divert the water, or alter the banks so as to injure the property of his neighbor. Strict laws for the prevention of pollution of rivers have been enacted by the Legislatures of the different States of the American Union, and in various European countries, this more especially in the vicinity of towns and cities, where the local authorities are charged with their enforcement.

Riverside, a city, county seat of Riverside Co., California, 56 miles east of Los Angeles. It has extensive fruit interests, being the center of a vast orange-growing section. Lemons, apricots, peaches and alfalfa also are produced; and there are manufactures of cement, building supplies, machinery, etc. Pop. (1910) 15,212; (1920) 19,341.

River Terraces, terraces on the sides of a valley through which a river flows, formed by the action of the water when the river bed had a higher elevation at some remote period.

River-tortoise, a name of a family of tortoises that are aquatic in their habits, coming to shore only to deposit their eggs. They are exclusively carnivorous, subsisting on fishes, reptiles, birds, etc. The edges of the mandible are so sharp and firm that they can easily snap off a man's finger. Well-known species are the soft-shelled turtle (*Trionyx ferox*) and the large and fierce snapping turtle (*Chelydra serpentina*) of America. (See *Snapping-turtle.*) They inhabit almost every river and lake in the warmer regions in the Old and New Worlds, and are particularly plentiful in the Ganges, where they prey on human bodies.

Rivet (riv'et), a short metallic pin or bolt passing through a hole and keeping two pieces of metal together; especially, a short bolt or pin of wrought iron, copper, or of any other malleable material, formed with a head and inserted into a hole at the junction of two pieces of metal, the point after insertion being hammered broad so as to keep the pieces closely bound together. Rivets are especially employed in making boilers, tanks, iron bridges, steel buildings, etc. They are closed up by hammering when they are in a heated state, the hammering being either done by hand or by machinery.

Riviera (riv-i-ā'ra), the Mediterranean coast from Nice to Spezzia, in France and Italy. It is a popular resort.

Rizal (rē-zal'), JOSÉ, a Filipino patriot, novelist and physician, born at Calamba, Province of Laguna, Luzon, June 19, 1861; executed December 30, 1896. His father, who was well to do, sent José to school in Manila, where he took the degree of B. A. while little more than a lad. Then he enrolled as a student in the University of Santo Tomas. Later he went to Europe and studied medicine and philosophy at Madrid, Paris, Heidelberg, and elsewhere. While abroad he began to write his great novels and plays describing life in the Philippines. His novel, *Noli Me Tangere* (1886), in which he denounced the Spanish administration of the islands and the alleged bigotry of the Church, created a profound impression. *The Social Cancer* and other works followed, full of passionate patriotism. It may be said that the real undoing of Spanish rule in the Philippines began with the writings of Rizal. The government in Luzon prohibited the circulation of his books, but they were smuggled in by friends of Philippine liberty. In 1896, on his way to Cuba from Hongkong (where he had lived from 1892), to assist as physician in the epidemic of yellow fever, he was arrested at Barcelona, brought to Manila, and, after a mock trial, was shot. The sixteenth anniversary of his death was declared by law a national holiday.

Rizzio (rit'sē-ō), DAVID, a native of Turin, who came to Scotland in 1564 in the train of the ambassador from Savoy, and soon became so great a favorite with the queen that he was appointed her secretary for foreign languages. (See *Mary Stuart.*) The distinction with which he was treated by his mistress soon excited the envy of the nobles and the jealousy of Darnley. A conspiracy, with the king at its head, was formed for his destruction, and before he had enjoyed two years of court

favor the Lord Ruthven and others of his party were introduced by Darnley into the queen's apartment, where they killed the object of their revenge, March 9, 1566.

Ro (rō), the name given a new artificial language, first proposed in 1906. This rejects all root words and is based solely on the letters of the alphabet, making these absolutely phonetic. No accents or diacritical marks are used. Thus initial 'A' denotes a pronoun, 'ab' indicating the pronoun of the first person, 'abc,' this pronoun in the nominative case. So, 'E' denotes verb, and is similarly varied by added letters for the varied grammatical or other requisites. This is claimed to be the scientific manner of word building.

Roach (rōch; *Leuciscus rutilus*), a species of fresh-water fish of the carp family (Cyprinidæ), found in many parts of Europe. Their average length is about 9 or 10 inches. They are of a grayish-green color, the abdomen being silvery white and the fins red. The average weight of the roach is under 1 lb., and though a favorite with anglers, it is not much esteemed for the table. Allied fishes receive the same name in America.

Road (rōd), an artificial avenue of travel formed through a country for the accommodation of travelers and the carriage of commodities. Though the Romans set an example as road-builders, some of their public highways being yet serviceable, the roads throughout most of Europe were in a wretched condition till towards the end of the eighteenth century. France was in advance of other countries in roadmaking; in England and the United States a decided improvement of the highways did not begin until the nineteenth century. The first important point to be considered in roadmaking is the route to be followed, a matter in which natural obstructions and inequalities of level have to be taken into account, besides the question of directness of route, the deviations advisable in order to accommodate certain centers of population, the expense of upkeep, etc. Natural obstructions are overcome by special contrivances, such as bridges, embankments, tunnels, etc. When diversities of level are necessary, road-engineers fix the degree of inclination at the lowest possible point. Telford estimated the maximum inclination of a road to be 1 in 24, but except in extreme cases it is considered better that it should not exceed 1 in 50. The *angle of repose*, or maximum slope on which a carriage will stand, has been estimated at 1 in 40. The width of the road is also a very important consideration as bearing both on the original cost and on the permanent maintenance. A properly-constructed road, besides a foundation, consists of two layers, an upper and under. After a good foundation is obtained the laying of a base, the best material being concrete of gravel and lime, gives durability to the road. Upon this base the actual roadway is laid with a slight inclination from the center to the sides for the purpose of drainage. Before the time of McAdam it was customary to use broken stones of different sizes to form the roadway, the consequence being that in course of time the smaller stones sank, making the road rough and dangerous. McAdam early in the nineteenth century (see *McAdam*) introduced the principle of using stones of uniform size from top to bottom. (See also *Pavement.*) The general superintendence of roadways is usually exercised by the government of a country, but it entrusts the execution of its enactments to local authorities. Highways are public roads which every citizen has a right to use. They are constituted by prescription, by act of legislature, or by dedication to the public use. What is known as the *rule of the road* is that in passing other horsemen or carriages, when going in the opposite direction, the rider or driver in America must pass on the right; if going in the same direction, he passes to the left; in England he always passes on the left of the other. The development of roads is now attracting much attention in the United States, the national and state governments taking part in financing an extensive system of well-built roads, the cost of those being estimated in 1915 to have reached $250,000,000. The general government has long taken part in this work and now proposes to add largely to its activity in this direction. Of such government roads the most notable was that begun in 1806, its first section running from Cumberland, Md., to Wheeling, Va. It was continued until it finally was carried to the Mississippi by aid of state funds, it constituting a broad and solid road much used in the westward flow of population. For other projects in this direction, under national and state enterprise, see *Dixie Highway* and *Lincoln Highway.* In 1916 the national government appropriated $85,000,000 for road improvement, $10,000 of this being for roads in National Parks and Forests, the remainder to be used during the coming five years in aid of state road building, each state aided by the government

being required to appropriate an equal sum from its own funds.

Roanne (ro-án), a town in France, department of the Loire, on the left bank of the Loire, which is here navigable, 40 miles N. W. of Lyons. It is an important railway center, and manufactures woolen, linen and cotton goods. Pop. (1911) 36,397.

Roanoke (rō'an-ōk), a city of Virginia, situated on the Roanoke River between the Blue Ridge and Alleghany mountains. It is in a fruit, general farming, stockraising and mining region and has very extensive locomotive and car works, steel and iron manufactures, silk and woodworking factories, canneries, etc. The Virginia College for Young Ladies is here. There are mineral springs in vicinity, and it is a health resort with a large sanitarium. It is served by the Virginia and the Norfolk & Western railroads. Pop. (1910) 34,874; (1920) 50,842.

Roanoke (ro-an-ōk'), a river, United States, in Virginia and North Carolina. It flows chiefly southeast, and after a course of about 250 miles falls into Albemarle Sound. It is tidal for 75 miles and is navigable for double that distance for small vessels.

Roaring (rōr'ing), in horses, is a disease of the nerves and muscles of the larynx which causes an obstruction to the passage of air, giving rise, when the horse is briskly exercised, to the peculiar sound from which the disease derives its name.

Roasting (rōst'ing), the cooking of meat by the direct action of fire—that is, by dry heat, either before the fire or in an oven. Roasting before an open fire is considered preferable to roasting in an oven (which is analogous to baking), on account of the free ventilation to which it exposes the meat during the process. The apparatus in most kitchens for open roasting are a fire, a pit, a contrivance for turning the meat to present all sides of it alternately to the fire, a screen to economize the heat, and a saucepan to catch the dripping. The fire must be kept even and bright throughout. During the process of roasting the meat should be basted with the dripping to keep it soft and allow the heat to penetrate. The desirability of roasting as compared with boiling is that it retains the saline ingredients of the meat. The time allowed for roasting is roughly estimated at a quarter of an hour to 1 lb. of meat. Longer time is required in winter than in summer, and for new than old killed meat.

Robbery (rob'ėr-i), a felonious and forcible taking away another man's goods or money from his person, presence, or estate by violence or putting him in fear. Violence or intimidation is the criterion which distinguishes robbery from other larcenies; and it is sufficient that so much force or threatening, by word or gesture, is used as might create an apprehension of danger, so as to lead a man to part with his property against his will. Highway robbery, or the forcible taking of property from travelers, in many countries is a capital offense, and in all civilized countries is severely punished.

Robbia, LUCA DELLA. See *Della Robbia.*

Robert (rob'ėrt), Duke of Normandy, surnamed *the Devil*, was the younger son of Duke Richard II by his marriage with Judith, a daughter of Count Godfrey of Brittany. In 1027 he succeeded his elder brother, Richard III, whom he is charged with having poisoned. The first years of his government were employed in bringing his rebellious vassals into subjection, and he then restored Count Baldwin of Flanders to his states, assisted Henry I, king of France, against his mother Constantia, and humbled Count Otho of Champagne. In 1034 his fleet was wrecked off Jersey while on its way to England to support his nephews Alfred and Edward against Canute, who had excluded them from the succession to the English throne. Hereupon he concluded a truce with Canute, by which the two princes were promised half of England. In 1033 he set out to visit the holy places, and subsequently made the pilgrimage to Jerusalem on foot. While returning he died suddenly at Nicæa in Asia Minor (1035), and is supposed to have been poisoned by his servants. His heroic deeds and penance have given rise to numerous stories. William the Conqueror was his son.

Robert I. See *Bruce, Robert.*

Robert II, King of Scotland, was the son of Marjory, daughter of Robert Bruce, and of Walter, steward of Scotland, and was thus the first of the *Stewart* or *Stuart* kings. He was born in 1316, and was recognized by parliament in 1318 as heir to the crown. On the death of David II he was crowned at Scone, March 26, 1371. He had long acted as regent, and had done good service in the English wars. An act of parliament in 1375 settled the crown on his sons by his first wife Elizabeth Mure of Rowallan, though illegiti-

mate by ecclesiastical law. His reign was comparatively a peaceful one, one of the chief events being the battle of Otterburn. He died in 1390.

Robert III, King of Scotland, eldest son of the preceding, was born in 1340 and was originally called John, but changed his name on his coronation, in 1390. Having been lamed by accident, he was unable to engage in military pursuits, and he trusted the management of affairs almost entirely to his brother, whom he created Duke of Albany. In 1398 Albany was compelled to resign his office by a party who wished to confer it on the king's eldest son, David, Duke of Rothesay. War was renewed with England, and the battle of Homildon Hill, September 14, 1402, resulted in a disastrous defeat of the Scots. In this year the Duke of Rothesay died in Falkland Castle, where he had been imprisoned; and it was commonly believed that he was starved to death at the instigation of Albany. Dread of Albany, who had recovered the regency, induced the king to send his second son, James, to France in 1406; but the vessel which carried him was captured by the English, and Henry IV long detained him as a prisoner. Soon after this event Robert died (1406).

Robert College, an institution for higher education at Constantinople, Turkey, founded by American philanthropists, named for Christopher Rhinelander Robert, a New York and New Orleans merchant (1802-78), incorporated in New York State in 1864 and recognized by Turkish officials in 1869. The curriculum is very much the same as that of the average American college. The teaching of English is emphasized, but other languages are also taught.

Robert of Gloucester, an English historian, is supposed to have been a monk in the abbey of Gloucester during the reign of Edward I. but of his private history nothing is known. His *History of England*, in verse, extends from the period of the fabulous Brutus to about A. D. 1300, and its language is the transition stage of English previous to Chaucer.

Roberts, Charles George Douglas, a Canadian author, born at Douglas, New Brunswick, in 1860. He was professor of literature at King's College, Nova Scotia, 1885-87, and of economics, 1887-95; associate editor of *The Illustrated American*, New York, 1895. His poems *Orian*, *In Divers Tones*, etc., brought him the title of 'The Longfellow of Canada.' He has also written works of history, novels, etc., and has been especially happy in dealing with stories of animal life. Among the latter are *The Heart of the Ancient Wood*, *The Kindred of the Wild*, *Hunters of the Silences*, etc.

Roberts, David, painter, was born in Edinburgh in 1796; died in 1864. He was apprenticed to a house-painter, but, with a view to the higher branches of his art, he pursued the study of drawing and painting. In 1826 he exhibited at the Royal Academy views of the cathedrals of Rouen and Amiens. His works include *Picturesque Sketches in Spain*, *Sketches in the Holy Land and Syria*, and *Italy—Classical, Historical and Picturesque*.

Roberts, Edmund Quincy, an American merchant, born in Portsmouth, N. H., in 1796; died in 1864. He was the first American diplomatist to visit Asia.

Roberts, Ellis Henry, an American editor, born in Utica, N. Y., in 1827; died in 1918. He was editor and part-proprietor of the Utica Morning Herald, 1851-89; served in Congress 1871-75, was assistant-treasurer of the United States, 1889-93, and treasurer, 1897-1905; was a delegate to the Republican National Convention.

Roberts, Oran Milo, an American jurist and politician, born in Laurens Dist., S. C., in 1815; died in 1898. He was president of the convention which voted Texas out of the Union in 1861; served in the Confederate army; was elected to the U. S. Senate in 1866, but not permitted to take his seat; was for a number of years Chief Justice of the Supreme Court of Texas, and governor, 1879-83; and for ten years professor of law at the University of Texas.

Roberts of Kandahar, Pretoria and Waterford, Frederick Sleigh, first Earl, a British soldier, born at Cawnpore, India, September 30, 1832; died November 14, 1914. He fought in the Indian mutiny, the Abyssinian campaign, and the Afghan war. In 1900 he commanded the British forces in the Boer war and in 1901 became commander-in-chief of the British army. He died while on a tour of inspection of the British expeditionary forces in France in the opening year of the great war.

Robertson (rob'ĕrt-sun), Frederick William, a celebrated preacher, was born in London in 1816. He matriculated at Oxford, in 1837; was curate at Christ Church, Cheltenham, 1842-46; became incumbent of Trinity Chapel, Brighton, in 1847; and held this

charge with increasing fame as a preacher till his death in 1853. His views on the Sabbath, the atonement, baptism, and inspiration were assailed as unorthodox, and he was accused of preaching democracy and socialism.

Robertson, Joseph, a Scottish antiquary, was born at Aberdeen in 1810; died in 1866. He was educated at the school of Udny, at Aberdeen Grammar School, and Marischal College, Aberdeen. In 1835 he published a humorous *Guide to Deeside*, under the pseudonym of John Brown. After serving as editor of several Scottish newspapers he became curator of the historical department of the Register House. The University of Edinburgh conferred on him the degree of LL.D. in 1864. His works include the *Book of Bon-Accord*, an archæological and historical guide to Aberdeen (1839), *Historics and Antiquities of the Counties of Aberdeen and Banff* (1843-62), *Inventory of Queen Mary's Jewels and Furniture* (1863), and *Concilia Scotiæ* (1866).

Robertson, Thomas William, an English dramatist, born in 1829; died in 1871. His parents being actors, he early went on the stage, but was never a success. In 1853 he settled in London, where for several years he struggled on with light literature. In 1864 he had considerable success with *David Garrick*, a play produced by Sothern; but his fame rests on a series of plays produced at the Prince of Wales' Theater (1866-70), including *Ours*, *Caste*, *Play*, *School*, and *M. P.* Though sneered at on their production by certain critics, and nicknamed 'cup-and-saucer dramas,' they deservedly secured a permanent place on the stage. His principal *Dramatic Works* (2 vols.) were published in 1890 by his son.

Robertson, William, a celebrated Scottish historian, was born at Borthwick, in East Lothian, where his father was minister, Sept. 19, 1721. After the completion of his course in the theological class of Edinburgh, Robertson obtained a license to preach in 1741, and in 1743 was presented to the living of Gladsmuir, in East Lothian. He soon obtained an ascendency in the General Assembly of the Church of Scotland by his eloquence and great talents for public business, which, exerted in favor of Conservative principles, gave him for a long time the lead in the ecclesiastical politics of Scotland. His *History of Scotland During the Reigns of Queen Mary and King James VI* appeared in 1759 (two vols. 4to). This work led to the author's appointment as chaplain of Stirling Castle in 1759, one of the king's chaplains in 1761, and principal of the University of Edinburgh in 1762. Two years after he was made historiographer-royal of Scotland. His *History of the Reign of Charles V* appeared in 1769, his *History of America* in 1777, and in 1791 *An Historical Disquisition Concerning the Knowledge which the Ancients had of India*. As an historian he is admired for skilful and luminous arrangement, distinctness of narrative, and highly graphical description. His style is pure, dignified, and perspicuous. He died in June, 1793.

Robespierre (rob-es-pi-ār), François Maximilien Joseph Isidore, was born at Arras in 1758, and was the son of an advocate. He was educated at the College of Louis-le-Grand at Paris. He afterwards practiced as an advocate at Arras, and held for a short period the position of judge in the bishop's diocese. In 1789 he was elected deputy to the States-general, and was a zealous supporter of democratic measures. At this time he became a

Maximilien Robespierre.

prominent member of the Jacobins and other revolutionary clubs. In March, 1791, he was appointed public accuser to the New Courts of Judicature. He remained in the background during the September massacres of 1792, which he assisted in planning, leaving the work with Marat and Danton. In the same month he was elected a member of the Convention, and in the proceedings against Louis XVI distinguished himself by the relentless rancor with which he

opposed every proposal to avert or delay the fatal result. On March 19, 1794, the Hébertists (see *Hébert*) fell victims to his jealousy. Eleven days later he caused the arrest of Danton, who, after a trial of three days, was guillotined, together with Camille Desmoulins, on April 5th. Robespierre's power now seemed to be completely established, and the Reign of Terror was at its height. On June 8, 1794, he, as president of the Convention, made the convention *decree* the existence of the Supreme Being; and on the same day he celebrated the Feast of the Supreme Being. In the meantime a party in the Convention was formed against Robespierre, and on July 27 he was openly accused of despotism. A decree of arrest was carried against him, and he was thrown into the Luxembourg prison. He was released by his keeper on the night of the same day, and conducted to the Hall of Commune, where his supporters were collected. On the following day Barras was sent with an armed force to effect his arrest. Robespierre's followers deserted him, and he was guillotined on July 27, 1794, together with some twenty-three of his supporters. The tendency with modern writers is to modify the character for infamy which at one time obtained regarding Robespierre.

Robin (rob'in), a name given to several birds, more especially to the robin redbreast of Europe (see *Redbreast*) and to an American species of blackbird (*Merŭla migratoria*), as also to the bluebird of America. See *Bluebird.*

Robin Goodfellow. See *Puck.*

Robin Hood. See *Hood, Robin.*

Robinia. See *Locust-tree.*

Robins (rob'inz), BENJAMIN, mathematician and artillerist, was born at Bath, England, in 1707. He was self-educated, and attained an extraordinary knowledge of mathematics, a subject which he taught in London. He also made experiments on projectiles, and his chief work, the *New Principles of Gunnery*, appeared in 1742. In 1749 he became engineer-in-chief to the East India Company, and fortified Madras, where he died of fever in 1751. He is believed to have had a share in the preparation of the narrative of Anson's *Voyage Round the World* (1740-44).

Robinson (rob'in-son), EDWARD (Biblical scholar), was born at Southington, Connecticut, in 1794. After serving as a professor of Biblical literature at Andover, he made a journey to the Holy Land, which gave rise to a work of great value, *Biblical Researches in Palestine, Mount Sinai, and Arabia Petræa* (1841). He died in 1863.

Robinson, JOHN (1576-1625), the pastor of the Pilgrim Fathers, an English Non-conformist, born probably in Lincolnshire. At first affiliated with the Puritans, who wished to reform the Church of England, he came out for complete separation, and to escape persecution fled to Holland in 1608. There his followers joined him, remaining under his guidance until 1620, when they set sail for England in the *Speedwell* and for America in the *Mayflower*. He had hoped to follow the Pilgrims, but died at Leyden, March 1, 1625. (See *Plymouth*, Mass., *Pilgrim Fathers*, and *Mayflower.*)

Robinson Crusoe, a celebrated romance, written by the well-known Defoe and published in 1719. See *Defoe.*

Rob Roy (rob roi; that is, 'Robert the Red'), a celebrated Highland freebooter, born about 1660, whose true name was Robert Macgregor, but who assumed his mother's family name, Campbell, on account of the outlawry of the clan Macgregor by the Scotch parliament in 1662. He became a partisan of the Pretender in the rebellion of 1715. The Duke of Montrose seized his estate, which caused him to engage in a brigandish war of reprisals for many years. He became widely celebrated for his exploits, and is the hero of one of the most popular of Scott's novels. He died in 1743.

Roc, a fabulous bird of immense size and strength, which is mentioned in the *Arabian Nights Entertainments.* A belief in it was spread in Europe during the middle ages, having been brought from the East probably as a consequence of the Crusades.

Rocambole (rok'am-bōl; *Allium scorodoprăsum*), a species of onion, having bulbs resembling those of the garlic. It is cultivated for the same purposes, and is considered as having a more delicate flavor.

Roccella. See *Archil.*

Rochambeau (ro-shȧn-bō), JEAN BAPTISTE DONATIEN DE VIMEUR, COUNT DE, Marshal of France, born in 1725, entered the French army in 1742, distinguished himself in the Seven Years' war, and became field-marshal in 1761. In 1780-82 he commanded the French forces sent to aid the revolted British colonists in America. He became governor of Artois and Picardy

and subsequently of Alsace, was made a marshal in 1790, and commanded the army of the north in 1792. During the Reign of Terror he narrowly escaped the guillotine. He died in 1807.

Rochdale (rok'dāl), a municipal and parliamentary borough of England, in Lancashire, 10 miles N. N. E. of Manchester. Rochdale is a place of considerable antiquity, and was early noted for its woolen manufactures, which have remained a chief staple till the present day. Cotton is extensively manufactured, and there are also foundries, machine-shops, etc., while in the neighborhood are quarries of freestone and extensive collieries. The town is irregularly built, and has many narrow streets, but of late years has been much improved. The parish church (St. Chad), of the twelfth century, situated on an eminence, is approached from the lower part of the town by a flight of 122 steps. The town-hall is a fine modern building, and there is a handsome free library. Rochdale is the center of the coöperative movement, which originated there in 1844. By means of canals it has a water communication with all the industrial centers of the north of England. Pop. (1911) 91,437.

Rochefort (rosh-fōr), or ROCHEFORT-SUR-MER, a strongly fortified seaport and naval arsenal of France, in the department of Charente-Inférieure, on the right bank of the Charente, about 9 miles above its mouth, 20 miles south of La Rochelle. It stands mostly on a low swampy flat, is regularly built, and is surrounded by ramparts. In the military port the largest vessels float at all times. Attached to it are shipyards, workshops, and storehouses of various kinds. A large naval hospital is outside the town. There is a good trade in colonial produce, wine, brandy, etc. Pop. (1911) 35,419.

Rochefort (rosh-fōr), HENRI (VICTOR HENRI, MARQUIS DE ROCHEFORT-LUÇAY), a French journalist, dramatist, and politician, born at Paris in 1830. Here he at first studied medicine, but on the death of his father, in 1851, he obtained a post in the prefecture. In 1859 he wrote for the *Charivari*, and he became one of the principal writers on the *Figaro*. Having been dismissed from the latter post by order of the ministry, he founded a weekly paper called *La Lanterne* in 1868, in which he vigorously attacked the emperor and the ministry. It was seized early in its career by the police, and Rochefort was fined and imprisoned. In 1869 he was returned to the legislative assembly by the first arrondissement of Paris. He then started a new paper, the *Marseillaise*, and for its attacks on the imperial family he was sentenced to six months' imprisonment in January, 1870. After Sedan he became a member of the government of National Defense. He fled from Paris in May, 1871, when he foresaw the end of the Commune, of which he had been a vigorous supporter, but was arrested by the Versailles government and sentenced to transportation to New Caledonia. He escaped in 1874, and after the general amnesty of 1880 returned to Paris (July 12), where he founded his new journal, the *Intransigeant*. He was returned as deputy by the department of the Seine, but resigned his seat in February, 1886. He published *The Adventures of My Life* (1896).

Rochefoucauld, FRANÇOIS, DUC DE LA. See *La Rochefoucauld.*

Rochejaquelein, HENRI DE LA. See *La Rochejaquelein.*

Rochelle (ro-shell), LA, a fortified town and seaport, France, capital of the department of Charente-Inférieure, on the Atlantic, 95 miles north by west of Bordeaux. The chief buildings are the cathedral, town-hall, exchange, courts of justice, hospital, arsenal, and a public library. The harbor is easily accessible and commodious. The roadstead is protected by the islands of Ré and Oléron. La Rochelle has an extensive trade in wines, brandies, and colonial produce. In the religious wars it was long a Protestant stronghold. It stood an eight months' siege in 1572, but in 1628 was forced to surrender to Richelieu after a three months' siege. Pop. (1911) 36,371.

Rochelle Salts, the double tartrate of sodium and potassium, crystallizing in large rhombic prisms. It has a mild, hardly saline taste, and acts as a laxative.

Roches-moutonnées (roshmö-ton-ā), the name given to the rounded and smoothed humps of rock occurring in the beds of ancient glaciers, from their fancied resemblance to the backs of sheep (*moutonné*, sheep-like). They have received their form and smoothness from the action of ice.

Rochester (roch'es-tur), a city, parliamentary borough, and river-port in England, in the county of Kent, 29 miles southeast of London, on the Medway, adjoining Chatham. It consists of Rochester proper, on the right bank of the river, and of Strood and part of Frindsbury parish on the left bank.

communication being kept up by an iron swing-bridge. Rochester consists principally of one spacious street, which traverses it in a S. S. E. direction towards Chatham, and of a number of minor streets. It was a place of importance even before the Roman period. The see was founded by the Saxon king of Kent, Ethelbert, who also founded the cathedral early in the seventh century. This edifice was destroyed by the Danes, but was rebuilt in the beginning of the twelfth century, and renovated in 1827-34. The massive square keep, built in the reign of the Conqueror, still remains. Pop. 31,388.

Rochester, a city of Minnesota, county seat of Olmsted Co., on Zumbro River, 90 miles S. E. of St. Paul. It is in a rich agricultural region, and has flour mills, machine shops, camera factory, etc.; also a surgical center, noted for its hospitals. Pop. (1910) 7844; (1920) 13,722.

Rochester, a city of Strafford Co., New Hampshire, 10 miles N. N. W. of Dover. It has large industries, including woolens, blankets, shoes, bricks, etc. Pop. (1920) 9673.

Rochester, a city, county seat of Monroe Co., New York, on Lake Ontario with a natural port on the Genesee River, and on the State Barge Canal. There are three falls on the river, developing 50,000 horse power. It is on the New York Central, Erie, Lehigh Valley, Pennsylvania, and Buffalo, Rochester & Pittsburgh railroads. Among its many interesting buildings are the State Armory, the University of Rochester (with its numerous buildings costing $1,500,000), the Dental Dispensary, Eastman School of Music, Chamber of Commerce Building, Court House, Mechanics' Institute, Catholic and Baptist theological seminaries, etc. The manufacturing interests are large. There are 1650 factories turning out 350 commodities, chief of which are cameras, camera supplies, optical goods, check protectors, thermometers, filing devices and office systems, and many other products. It leads the country in the production of high-class ivory buttons; produces 60% of the typewriter and carbon ribbon; ranks fourth in the production of shoes and men's clothing (annual output of shoes, $55,000,000; of clothing, $60,000,000); and is headquarters for the nursery business. It is a large machinery center and has several automobile factories. Pop. (1900) 162,608; (1910) 218,149; (1920) 295,750.

Rochester, a borough in Beaver Co., Pennsylvania, on the N. bank of the Ohio, 26 miles N. W. of Pittsburgh. It has natural gas and oil wells, and glass, brick, pottery, etc., are produced. Pop. (1920) 6957.

Rochester, JOHN WILMOT, EARL OF, a witty and profligate nobleman of the court of Charles II, was born in Oxfordshire in 1647 or 1648, and educated at Wadham College. He succeeded to the title and estates in 1659. He served in the fleet under Lord Sandwich, and distinguished himself at the attack on Bergen. On his return to England he became the personal friend and favorite of the king. His constitution gave way under his habits of drunkenness and debauchery, and he died in 1680. His poetical works consist almost wholly of satires, love-songs, and drinking-songs, many of them being gems of wit and fancy, while many of them are daringly immoral.

Roche-sur-Yon (rosh-sur-yon), LA, formerly NAPOLÉON VENDÉE and BOURBON VENDÉE, a town of France, capital of the dep. of Vendée, on the river Yon, 49 miles S. of Nantes. It was made the capital of the department by Napoleon I, in 1807, being then a mere village. Pop. 14,885.

Rochet (roch'et), a lawn or lace garment, somewhat like the surplice in shape, but with close-fitting sleeves, worn by bishops and other high ecclesiastical dignitaries.

Rochette (ro-shet), DÉSIRÉ RAOUL, often called *Raoul-Rochette*, a French archæologist, born in 1790, for a number of years keeper of medals and antiquities at the Royal Library, and professor in archæology at the Collége de France; from 1838 secretary of the Academy of Fine Arts. He died at Paris in 1854. His principal works are: *Histoire Critique de l'Etablissement des Colonies Grecques* (4 vols., 1815), *Monuments Inédits d'Antiquités* (1828), *Mémoires de Numismatique et d'Antiquité* (1840), *Mémoires d'Archéologie Comparée.* His *Letters on Ancient Art* were translated into English by H. M. Westropp, and published in 1854.

Rock, in geology, is a term applied to any considerable aggregation of mineral matter, whether hard and massive, like granite, marble, etc., or friable and unconsolidated, like clay, sand, and gravel. In popular language, however, it is confined to any large mass of stony matter, as distinguished from soil, mud, sand, gravel, etc.

Rock Bass, a mottled bass (*Amblo-plites rupestris*) of the United States; found among rocks in streams and lakes.

Rock-crystal. See *Quartz.*

Rockefeller (rok'e-fel-ėr), JOHN DAVIDSON, capitalist, born at Richford, New York, July 8, 1839. A poor boy, he became a clerk in a small oil-refinery at Cleveland, Ohio, at the age of 19, showed great business ability, and soon after became partner in a firm engaged in the oil business. His business developed and enlarged with great rapidity, and in 1870 was consolidated with others as the Standard Oil Company. In 1882 the Standard Oil Trust, controlling the vast petroleum trade of the United States, was organized, he being its leading spirit. Its methods were subsequently reprobated and suits against it were brought in the United States courts, but it acquired vast wealth, and Rockefeller, as its head, finally retired from business with a fortune estimated at many hundreds of millions. Since his retirement he has given great sums from his enormous income for educational and other purposes, including a total of $43,000,000 to the General Education Board, over $30,000,000 to the University of Chicago, and large amounts to various institutions, including Harvard University, Vassar College, the Institute for Medical Research, New York, etc. A great gift of $100,000,000, offered to be used towards the extirpation of poverty, was chartered as the Rockefeller Foundation in 1913.

Rocket (*Brassica erūca*), a cruciferous plant of the cabbage genus growing wild in many parts of Europe. It has a strong, disagreeable odor, an acrid and pungent taste, but is much esteemed by some, and especially by the Italians, who use it in their salads. Its medicinal properties are antiscorbutic and stimulant. The stem is about 1½ foot high, rough, with soft hairs, and bearing long pinnated leaves; the flowers are whitish or pale yellow, with violet veins. The term rocket is also applied to the different species of *Hespĕris* — cruciferous plants with purple flowers, often cultivated for ornament in gardens.

Rocket, a projectile consisting of an iron cylinder filled with an inflammable composition, the reaction of the gases produced by the combustion of which, pressing on the head of the rocket, serve to propel it through the air. Rockets were first used in eastern countries. Sir W. Congreve first made them of iron, and introduced them into the British service under the name of Congreve rockets. They were kept point first by the use of a stick, which acted on the principle of an arrow's feathers. But the rocket now used in the British service has no stick, being kept point first by rapid rotation, imparted to it by means of three curved shields fixed on the base so as to be on the same side of each vent. (See the accompanying figure.) Rockets may be discharged from tubes or troughs, or even laid on the ground. In war rockets are chiefly used for incendiary purposes, for moral effect — especially frightening horses, and for various irregular operations. *Signal* and *sky* rockets are small rockets formed of pasteboard cylinders, filled with combustible materials, which, when the rocket has attained its greatest height and bursts, cast a brilliant light which may be seen at a great distance. For another variety of rockets see *Life-rockets.*

Rocket.

Rock-fish, or BLACK GOBY (*Gobius niger*), a European fish belonging to the family of the gobies. This fish is found on rocky coasts chiefly and inhabits the deeper rock-pools left after the receding tide. The body is generally covered by an abundant mucous secretion, beneath which the small scales covering the body are almost concealed. Some of the wrasses are also occasionally known by the name of 'rock-fishes,' as are also American fishes of the genus *Scorpæna.* See also *Bass.*

Rockford (rok'ford), a city, county seat of Winnebago Co., Illinois, on the Rock River, 85 miles W. N. W. of Chicago, on several railroads. There is water power, and the city has extensive manufactures including hosiery, furniture, agricultural implements, gas engines, stoves, pianos, milling and other machinery, mirrors, silver plate, watches, iron and brass goods, etc. It is the seat of Rockford College, for women (founded 1849). Pop. (1910) 45,401; (1920) 65,651.

Rockhampton (rok-hamp'tun), the port of Central Queensland, on the Fitzroy River, 35 miles from its mouth, connected with North Rockhampton by a handsome bridge. The streets are wide, lined with trees, and ornamented with numerous handsome buildings. Port Alma, at the mouth of the Fitzroy, is a fine natural harbor. Rich gold-fields are in the vicinity. Pop. 15,461.

Rock Hill, a city of York Co., South Carolina, 80 miles N. of Columbia. Seat of Winthrop Normal and Industrial College, a State school for girls, with over 1000 students. There are automobile manufacturers, cottonseed-oil mills, lumber and planing mills, fertilizer plants,

etc. Alfalfa, cotton, and general farm products in surrounding district. It has the commission form of government. Pop. (1920) 8809.

Rockhill, WILLIAM WOODVILLE (1854-1915), an American diplomat, born in Philadelphia, entered the diplomatic service in 1884 as second secretary of legation at Peking, China. He was appointed first assistant Secretary of State in 1896, director of the Bureau of American Republics in 1899, United States minister to China in 1905, ambassador to Russia in 1909, and ambassador to Turkey, 1911.

Rockingham, a town including Bellows Falls village on Connecticut River, Windham Co., Vermont. Pop. (1920) 6231.

Rock Island, a city, county seat of Rock Island Co., Illinois, on the Mississippi River at the foot of the Upper Rapids, 180 miles W. of Chicago. It is the home of Villa de Chantal school for girls and the Augustana College. On an island in the river is a great U. S. arsenal and armory. Bridges connect the island with the city and with Davenport, Iowa. Water power is provided by a dam in the Mississippi. The city is an important center of railroad and river traffic and has numerous industries, including tractors, farm implements, oilcloth, stoves, athletic goods, iron works, hardware, automobile specialties, storage batteries, farm lighting plants, furnaces, paints, sash and doors, mill work, etc. Pop. (1910) 24,335; (1920) 35,177.

Rockland, a city, county seat of Knox Co., Maine, on an inlet of Penobscot Bay, 60 miles S. of Bangor. It is on two railroads and has steamer connection with various ports. It has extensive limekilns, limestone quarries, shipbuilding yards, iron works, etc. Its fisheries are also important. Pop. 8109.

Rockland, a town of Plymouth Co., Mass., 18 miles S. S. E. of Boston. It has manufactures of shoes, tacks, nails, etc. Pop. (1920) 7544.

Rockling (*Osnos* or *Motella vulgāris*), a fish included in the cod family, and known also as the three-bearded rockling from the barbs on its snout; two other species are the four-bearded and five-bearded.

Rock-pigeon, a pigeon that builds its nest in hollows or crevices of rocks and cliffs, especially the *Columba livia.*

Rock-rose. See *Cistus.*

Rock-salt, native chloride of sodium, that is, common salt, in the solid form, in masses or beds.

Rock-scorpion (*Buthus* or *Scorpio afer*), a species of scorpion found in Africa, averaging about 6 inches in length. The bite of this animal, although not absolutely fatal, is yet considered to be dangerous.

Rock-snake, or NATAL PYTHON (*Python Natalensis*), a non-venomous African snake, attaining a length of over 25 feet.

Rock Springs, a city of Sweetwater Co., Wyoming, 258 miles W. of Laramie, in a coal-mining district. Also has farming and livestock interests. Pop. (1920) 6456.

Rock Trout, sometimes called 'greenlings' from their color, a family of sea fishes (*Hexagrammidæ*), found in the North Pacific.

Rockville, a city of Tolland Co., Conn., on Hockanum River, 15 miles N. E. of Hartford. It has water power and manufactures of silk and woolen goods, envelopes, etc. Pop. (1920) 7726.

Rockville Center, a residential village of Nassau Co., New York, on Long Island, 19 miles E. of New York. Pop. (1920) 6262.

Rocky Mount, a city of Nash and Edgecombe counties, North Carolina, on the Atlantic Coast Line. Commercial and railroad center, with six tobacco factories, two cottonseed-oil and fertilizer factories, cotton and hosiery mills, several lumber and woodworking factories, etc. Pop. (1910) 8051; (1920) 12,742.

Rocky Mountains, a name indefinitely given to the whole of the extensive system of mountains which covers a great portion of the western half of North America, but more particularly applied to the eastern border of this mountain region, commencing in New Mexico in about 32° 30′ N. lat., and extending throughout the continent to the Polar Sea; terminating west of the Mackenzie River, in lat. 69° N., lon. 135° W. The Rocky Mountains in the United States are divided into two parts in Southern Wyoming by a tract of elevated plateaus. The chief groups of the southern half are the Front or Colorado Range, which in Wyoming has a mean elevation of 9000 feet (at Evans' Pass, where it is crossed by the Union Pacific Railway, 8269 feet). In Colorado it increases to a mean height of 13,000 feet, its highest points being Gray's Peak (14,341 feet), Long's Peak (14,271 feet), and Pike's Peak (14,147 feet). The Sawatch Range, south of the Arkansas River, has its highest peak in Mount Harvard (14,375 feet), with passes at an eleva-

tion of from 12,000 to 13,000 feet. The 'Parks' of Colorado are high mountain valleys known as North, Middle, South, and San Luis parks, with an elevation of from 6000 to 10,000 feet, surrounded by ranges 3000 to 4000 feet higher. The west border of the San Luis Park is formed by the San Juan Range with at least a dozen peaks over 14,000 feet, and between one and two hundred above 13,000 feet. On the northeastern side this park is bounded by the Sangre de Cristo Range, in which is Blanca Peak (14,464 feet). The Uintah Range, directly west of North Park, has several points above 13,000 feet; and the Wahsatch Range, which forms the western limit of the southern division of the Rocky Mountains, rises to a height of 12,000 feet just east of Salt Lake City. The northern division of the Rocky Mountains, with the exception of the Wind River Range and the Yellowstone region (see *Yellowstone*), is lower and has less impressive scenery than the southern. In Idaho and Montana the groups are more irregular in outline than in the south, and the division into ranges more uncertain. Of these the Bitter Root Mountains in part of their course form the divide between the Missouri and the Columbia. There two ranges reach altitudes of upwards of 9000 feet, and are crossed by a number of passes at elevations of from 5500 to 6500 feet. The Northern Pacific Railway crosses at Mullan's Pass (5548 feet) through a tunnel 3850 feet long. The Crazy Mountains, north of the Yellowstone, reach a height of 11,000 feet; other groups are the Big Horn Mountains and the Black Hills, whose highest point is Mount Harvey (9700 feet). In Canada the highest known peaks are Mount Brown (16,000 feet) and Mount Hooker (15,650 feet), lying about 53° N. lat.: the general altitude of this part of the range varying from 10,000 to 14,000 feet. The pass leading between Mount Brown and Mount Hooker, called the Athabasca Portage, has a height of 7300 feet. The Rocky Mountains contain some of the finest scenery in the world, and are specially rich in deposits of gold, silver, iron, copper, etc., which are worked extensively. The Alaskan Mountains have the highest peaks on the continent. Mt. McKinley, 20,464 feet; St. Elias, 18,016 feet, etc.

Rocky Mountain Sheep, the *Ovis Montana*, or wild sheep of the Rocky Mountains, called also Big Horn (q. v.). It frequents the craggiest rocks.

Rococo (rō-kō′kō), a debased variety of the Louis-Quatorze style of ornament, proceeding from it through the degeneracy of the Louis-Quinze. It is generally a meaningless assemblage of scrolls and crimped conventional shell-

Rococo Ornament.

work, wrought into all sorts of irregular and indescribable forms, without individuality and without expression.

Rocou. Same as *Annatto* (which see).

Rocroi, or ROCROY (rok-rwâ), a small fortified town of France, dep. Ardennes, near the Belgian frontier, celebrated for the victory gained (1643) by the Duke d'Enghien (afterwards the great Condé) over the Spaniards. Pop. 2900.

Rod, a measure of length equal to 16½ feet. (See *Pole.*) A square rod is the usual measure of brick-work, and is equal to 272¼ square feet.

Rodentia (rō-den′shi-a), or RODENTS, an order of mammalia, comprising the gnawing animals, such as rats, mice, squirrels, rabbits, etc. They are distinguished by the following characteristics: the teeth are limited to molars and incisors, canines being entirely absent; the molars have tuberculated or flattish crowns, and are especially adapted for the attrition of food;

Rodentia.

A. Skull of a Rodent (*Cynomys*). B. Molar teeth, upper jaw of Beaver (*Castor fiber*).

the incisors are long, and spring from permanent pulps, thus being continually reproduced and shoved outwards from their bases. In the typical species the outer faces of the incisors are covered with hard enamel, but not the inner ones,

hence the latter are soft and wear away faster than the anterior surfaces, thus keeping a sharp edge on the teeth. The digits are generally four or five in number, and are provided with claws. The intestine is long, and the cæcum generally large. The brain is almost destitute of convolutions. The eyes are placed laterally. The rodentia are divided into two main divisions or suborders, viz. *Simplicidentata*, represented by mice, rats, squirrels, marmots, beavers, porcupines, etc., having the incisors strictly limited to two in each jaw; and *Duplicidentata* or *Lagomorpha*, comprehending hares and rabbits, distinguished by four incisors in the upper jaw and two in the lower.

Roderick (rod'ėr-ik), last of the Visigoth kings of Spain, an almost legendary personage. On the deposition of King Witiza in 710 he was elevated to the throne. Shortly after his reign began, a conspiracy was formed against him by the sons of Witiza and others. Roderick met them at Xerxes de la Frontera, where his army was completely defeated with heavy loss, and he was killed in the battle. His fate is the theme of several old Spanish romances, and of poems by Scott and Southey.

Rodez (rō-dez'). a town of France, capital of the department of Aveyron, on a height above the Aveyron, 148 miles by rail northwest of Montpellier. It has steep narrow streets and mean houses, mostly of wood; a cathedral with a lofty and singularly-constructed tower, episcopal palace, public library, town-houses, etc. Pop. 15,386.

Rodin (rō-dăn'), Auguste (1840-1917), French sculptor, painter and etcher, born in Paris. By his intense realism and by his impressionistic methods he may be considered the leader of the modern school of sculpture. Against the stereotyped kind of sculpture he opposed a brilliant impressionistic realism that arrested the attention of the world. One of his most noted creations, full of esthetic beauty and with a strong appeal to the imagination, was *La Penseur*, a somber bronze, seated brooding on the steps of the Pantheon. His sculptures include *Balzac*, *Victor Hugo*, *The Kiss*, *The Age of Brass*, *The Hand of God*, etc. He did not marry till he was 77, his bride being Rose Beurre, his old companion and model for many of his works.

Rodin Museum. The Musée Rodin (named for the sculptor, Auguste Rodin, 1840-1917) is in the Faubourg St. Germaine, Paris. The building is the old Hotel Biron, which was designed by the famous architect, Jacques Gabriel, and has many quaint nooks, corners and hallways. It is famous for the many dignitaries who have lived there. Rodin made it his home and his workshop in his older years. He collected there many choice pieces of antique sculpture and ceramic art, together with about 1800 pieces of his own work, including many of his drawings and his famous Gate of Hell, The Sphynx, Balzac, Adam, and The Bronze Age. While he was living and working in the old château, commercial Paris, reaching out along the Faubourg St. Germaine, announced its intention of tearing down the historic Biron and replacing it with more modern and more profitable structures. When Rodin and his friends became informed of the menace to the artist's home and studio, such a furor was raised that the hotel was saved. Rodin then deeded his home to the French Government as a national museum, stipulating only that he be allowed to live there until his death. There he continued to work, and there, now, is the Musée Rodin, in which may be found not only Rodin's works, but paintings by Monet, Renoir, Manet, and others of the impressionist school.

Rodney (rod'ni), George Brydges, Baron Rodney, a British naval officer (1719-92), born at Walton-upon-Thames. He became a lieutenant in the navy in 1739, and in 1749 went to Newfoundland as governor. In 1759 he bombarded Havre de Grâce in face of the French fleet. In 1779 he was appointed to the chief command on the West India station, and in January, 1780, completely defeated a Spanish fleet under Langara off Cape St. Vincent. He sailed for the West Indies again in 1781, and on April 12, 1782, obtained a decisive victory over the French fleet under De Grasse.

Rodolph I (rō'dolf; or Rudolf), of Hapsburg (1218-91), Emperor of Germany, founder of the former imperial house of Austria, was the eldest son of Albert IV, count of Hapsburg and landgrave of Alsace. Elected emperor in 1273, he defeated Ottokar, king of Bohemia, and gave the latter's territories to his sons, Albert and Rodolph.

Rodolph II (or Rudolf), Emperor of Germany, son of Maximilian II, was born at Vienna in 1552. He was elected emperor in 1576, having already been crowned king of Hungary and Bohemia. He was a weak ruler. War with the Turks broke out, and discontent everywhere prevailed. In 1607 his brother Mathias was elected king of Hungary, and in 1611 Rodolph was compelled to cede the crown of Bohemia also to his

brother. He died in 1612, and was succeeded by Mathias.

Rodosto (rō-dos'tō), a town of Turkey in Europe, on the north shore of the Sea of Marmora, with some handsome streets, large caravanseries, and public baths. The environs are covered with vineyards, producing an excellent wine. Pop. about 35,000.

Rodriguez (rō-drē'gez), an island in the Indian Ocean, 344 miles east of Mauritius, of which British colony it is a dependency; area about 100 square miles. The climate is healthy, but there are frequent hurricanes. The soil is very fertile. Exports include maize, beans, cattle, fish, poultry, and fruit. Rodriguez was annexed in 1810. Pop. (1907) 4231.

Roe (rō), Edward Payson, novelist, was born at New Windsor, New York, March 7, 1838; died July 19, 1888. He was educated for the ministry and became a Presbyterian minister, and was a nurseryman and fruit grower 1874–84. Among his works are *Barriers Burned Away*, *Opening of a Chestnut Burr*, *Nature's Serial Story*, *Success with Small Fruits*, etc.

Roebling (rōb'ling), John Augustus, engineer, was born at Mülhausen, Prussia, in 1806, and in 1831 came to the United States and settled in Pittsburgh. He became distinguished as a constructor of suspension bridges, his first great work being a railroad suspension bridge across the Niagara River, completed in 1855. His greatest work was the famous suspension bridge across the East River, connecting New York and Brooklyn. He died July 22, 1869, while this bridge was in progress, its completion being left to his son, Washington Augustus Roebling, born at Saxonburg, Pennsylvania, in 1837. The latter served as an engineer officer during the Civil war, attaining the rank of colonel of volunteers. He completed the East River bridge in 1883, and afterwards became superintendent of a large wire factory at Trenton.

Roebuck, Roe-deer (rō'buk; *Capreŏlus capræa*), a European deer of small size, the adult measuring about 2 feet at the shoulders. The horns or antlers are small, and provided with three short branches only. The general body-color is brown, whitish beneath. These animals inhabit mountainous and wooded districts. When irritated or alarmed they may prove very dangerous adversaries, and are able to inflict severe wounds with their antlers.

Roebuck, John Arthur, an English politician, was born at Madras in 1802; died in 1879. He was called to the bar in 1832, and became a queen's counsel in 1843. In the reformed parliament of 1832 he was returned for Bath as an advanced Liberal. He lost his seat in 1837, regained it in 1841, only to lose it again in 1847. Sheffield returned him in 1849, and he represented that city for twenty years. He defended the Crimean war, and it was by his motion to appoint a committee to inquire into the condition of the army before Sebastopol that the Aberdeen ministry was overthrown. His denunciation of trades-unions lost him his seat in 1868, but he regained it in 1874. He gave his support to the Eastern policy of Lord Beaconsfield.

Roentgen Rays, discovered in 1895 by W. K. Röntgen. See *Röntgen* and *X Rays*.

Roermond (rör'mond), a town of Holland, prov. Limburg, at the confluence of the Roer and Maas, 28 miles north by east of Maestricht. It is well built, has a large and beautiful parish church; an old abbey church, the Munsterkerk, built in the thirteenth century, etc. Pop. 12,348.

Roeskilde (*reu*'skil-de), a seaport of Denmark, in the Island of Zealand, 18 miles west of Copenhagen, formerly among the most important towns of Denmark. It contains a beautiful cathedral, built in 1047. Pop. 8358.

Roestone (rō'stōn), a variety of oölite composed of small rounded particles like fish roe.

Rogation Days (rō-gā'shun; Lat. *rogatio*, a request), the Monday, Tuesday, and Wednesday before Holy Thursday or Ascension Day, so-called from the supplications or litanies which are appointed in the Roman Catholic Church to be sung or recited in public procession by the clergy and people. In England, after the Reformation, this practice was discontinued, but it survives in the custom (observed in some places) of perambulating the parish boundaries.

Roger I (roj'er), Count of Sicily, one of the numerous sons of Tancred de Hauteville, a Norman baron in France, was born about 1031. He joined his brother Robert Guiscard in Apulia in 1057, and assisted him to found the kingdom of the Two Sicilies. He captured Messina in 1061, Palermo was reduced in 1072, and Agrigentum in 1087, the conquest of the island being thus completed. Upon the death of Robert in 1085 Southern Italy as well as Sicily came into Roger's hands. He died in 1101.

Roger II, King of Sicily, second son of the above, at his father's death was only five years of age. When he came of age Roger executed his task of governing Sicily with great ability and courage, and his sway was gradually extended over a great part of S. Italy. By the antipope Anacletus in 1130 he was honored with the title of king. In spite of repeated revolts of the barons, and although the German emperor Lothair and the Greek emperor Emmanuel were leagued against him, and Innocent II excommunicated him, he defended himself with success and defeated the pope's forces at Galluzzo, taking Innocent prisoner. Peace was made, the pope annulled all excommunication against Roger, and recognized his title of king. Roger afterwards fought with success against the Greeks. He died in 1154, and was succeeded by a son and a grandson.

Roger of Hoveden (roj'ẽr ov huv'-den), an English chronicler of the twelfth century. He was a clerk and a member of the royal household of Henry II, and seems to have been well versed in law.

Roger of Wendover, an early English chronicler, of whom little is known, except that he was a monk of St. Albans, afterwards prior of Belvoir, and died at St. Alban's Abbey, May 6, 1237. He was the writer of the work entitled *Flores Historiarum* ('Flowers of Histories').

Rogers (roj'ẽrz), Fairman, engineer, born at Philadelphia in 1833; died Aug. 23, 1900. He was lecturer on mechanics at the Franklin Institute 1853–65, and professor of civil engineering at the University of Pennsylvania 1855–70. He was one of the original members of the National Academy of Sciences. In addition to scientific works, he published a useful *Manual of Coaching.*

Rogers, Henry H., capitalist, born at Fairhaven, Massachusetts, Jan. 29, 1840; died May 19, 1909. He began his business career by selling newspapers; then took a position in his father's grocery store at three dollars a week. On the discovery of the Pennsylvania oil wells he sought that locality, made himself familiar with the business, entered the oil establishment of Charles Pratt, of Brooklyn, and when the Standard Oil Company was formed, he and Mr. Pratt became trustees of this great organization. In 1890 he was president of the company, and long continued the greatest force in its management, being a man of remarkable financial and business capacity. He was connected with other business concerns and acquired before his death an estate worth considerably over $100,000,000.

Rogers, John, an English martyr, born about 1500; burned at the stake at Smithfield, London, Feb. 4, 1555. He brought out in 1537 Matthew's Bible, compiled from Tyndale's and Coverdale's translations. For his violent tirades against Roman Catholicism he was tried before Bishop Gardiner and condemned to death as a heretic.

Rogers, John, sculptor, born at Salem, Massachusetts, Oct. 30, 1829; died July 27, 1904. He studied art in Paris and Rome, and won fame by a large number of small genre groups, homely, unconventional, but entirely true to nature. Among the best known are *The Checker Players, The Charity Patient, The Town Pump, The Country Post Office,* and various similar subjects. His larger works include an equestrian statute of General Reynolds, at Philadelphia, and a statue of Abraham Lincoln.

Rogers, Randolph, sculptor, born at Waterloo, New York, in 1825; died in 1892. He made Rome his chief place of residence after 1855. His most important works are the bronze doors of the Capitol at Washington, with scenes from the life of Columbus in relief, a statue of Lincoln, in Fairmount Park, Philadelphia, and monuments and statues in other cities.

Rogers, Samuel, an English poet, born at Stoke-Newington, London, July 30, 1763; died December 18, 1855. His father was a leading member of a Dissenting congregation, and a banker by profession. After completing his attendance at school, young Rogers entered the banking establishment as a clerk, but his favorite pursuits were poetry and literature. His first appearance before the public was in 1786, when he gave to the world his *Ode to Superstition, and other Poems. The Pleasures of Memory,* with which his name is principally identified, appeared in 1792, and *An Epistle to a Friend* (1798). In 1812 he published *The Voyage of Columbus,* a fragment; in 1814, *Jacqueline,* a tale; in 1819, *Human Life;* and in 1822, *Italy,* a descriptive poem in blank verse. He was, until within a few years of his death, a man of extremely active habits, and his benevolence was exerted to a large extent on behalf of suffering or friendless talent. He formed a remarkable collection of works of art, etc., and issued sumptuous editions of his own works, with engravings on steel from drawings by Turner and Stothard. A volume of his *Table Talk* was published by his friend Alexander Dyce (London, 1856).

Roggeveld Mountains (rog'e-velt), a range in the southwestern division of Cape Colony, running N. W. to S. E. with an average height of 5000 feet.

Rogue (rōg), in law, a vagrant or vagabond. Persons of this character were, by the ancient laws of England, to be punished by whipping and having the ear bored with a hot iron. The term *rogues and vagabonds* is given to various definite classes of persons, such as fortune-tellers, persons collecting alms under false pretenses, persons deserting their families and leaving them chargeable to the parish, persons wandering about as vagrants without visible means of subsistence, persons found on any premises for an unlawful purpose, and other improper idlers.

Rohan (rō-äṇ), HENRI, DUKE OF, a French Protestant leader, born in 1579. In his sixteenth year he joined the court of Henry IV, and after the death of the latter, in 1610 became chief of the Huguenots. After the fall of Rochelle (1628), and the peace of 1629, Rohan withdrew from France, and in exile wrote his *Mémoires sur les Choses Advenues en France Depuis la Mort de Henri IV* (Paris, 1630). He commanded the Venetian troops against Austria until the peace of Cherasco in 1631. In 1638 he joined the Protestant army on the Rhine, and died of wounds received at the battle of Rheinfelden on April 13, 1639. He was the author of *Mémoires sur la Guerre de la Valteline* (1638), *Les Intérêts des Princes* (1649), and *Discours Politiques* (1693).

Rohan, LOUIS RENÉ EDOUARD, PRINCE DE, Cardinal-bishop of Strasburg, was born in 1734 at Paris. In 1772 he went as ambassador to the court of Vienna. He derives his notoriety, however, chiefly from the affair of the necklace. (See *La Motte.*) He was then grand almoner of France, and being thrown into the Bastille, continued in prison more than a year, when he was acquitted and released by the parliament of Paris, August, 1786. He died in Germany in 1803.

Rohilkhand (rō-hil-kund'), or ROHILCUND, a division of British India, N. W. Provinces; area, 10,720 square miles; pop. 5,479,688. The surface is a plain, with a gradual slope south, in which direction its principal streams, Ramganga, Deoha, and others, flow to the Ganges. It takes its name from the Rohillas, an Afghan tribe, who gained possession of it early in the eighteenth century. It is subdivided into the districts Bijnur, Muradabad, Budaon, Bareli, Terai, and Shahjahanpur. It incloses the native principality of Rampur.

Rohlfs (rōlfs), FRIEDRICH GERHARD, a celebrated African traveler, born in 1831 at Vegesack, Germany. He studied medicine, and in 1855–60 he served with the French in Algiers as surgeon in the foreign legion. In 1860 he traveled through Morocco dressed as a Mussulman, and explored the Tafilet Oasis in 1862. In 1863, and again in 1865, he traveled in North Africa, making his way on the latter occasion from Tripoli to Lake Tchad, Bornu, etc., and finally to Lagos on the west coast. He joined the English Abyssinian expedition in 1867. In 1868 he traveled in Cyrenaica, and in 1873-74 he conducted an expedition through the Libyan Desert. He traveled across North America in 1875–76, and in 1878 he undertook a new journey to Africa, and penetrated to the Kufra Oasis. In 1880 he visited Abyssinia. He was appointed German general-consul at Zanzibar in 1884, and returned to Germany in 1885. His works include *Journey Through Morocco* (1869), *Land and People of Africa* (1870), *Across Africa* (1874–75), *Journey from Tripoli to the Kufra Oasis* (1881), *My Mission to Abyssinia* (1883), etc. He died in 1896.

Rojestvensky, Vice-admiral SINOVI PETROVITCH. Born 1849. Entered Russian navy and distinguished himself in Russo-Turkish war in 1877. Commanded the Russian fleet in the battle of the Sea of Japan in the Russo-Japanese war, which was defeated by the Japanese fleet under Vice-admiral Togo, May 27 and 28, 1904. Later he was tried by court-martial for cowardice in surrendering his vessel, but acquitted. Died January 14, 1906.

Roland (rō'land), or ORLANDO, a celebrated hero of the romances of chivalry, and one of the paladins of Charlemagne, of whom he is represented as the nephew. His character is that of a brave, unsuspicious, and loyal warrior, but somewhat simple in his disposition. According to the *Song of Roland*, an old French epic, he was killed at the battle of Roncesvalles after a desperate struggle with the Saracens, who had attacked Charlemagne's rear-guard. The celebrated romantic epics of Boiardo (*Orlando Innamorato*) and Ariosto (*Orlando Furioso*) relate to Roland and his exploits.

Roland de la Platière (ro-läṇ dė lå plåt-yār), JEAN MARIE, a French author and statesman, born in 1734. Previous to

the revolution he was engaged in manufactures, but, being sent to Paris by the city of Lyons, on official business, he became connected with Brissot and other popular leaders, through whose influence he was appointed minister of the interior in 1792. He was dismissed by the king after a few months; but on the fall of Louis he was recalled to the ministry. After the proscription of the Girondists he was arrested, and on receiving news of the death of his wife he killed himself. Roland was author of a *Dictionary of Manufactures*, and of other works.— His wife, MARIE JEANNE PHLIPON, was born at Paris in 1754. After her marriage in 1779 she took part in the studies and tasks of her husband, and accompanied him to Switzerland and England. On the appointment of her husband to the ministry she participated in his official duties, and took a share in the political councils of the leaders of the Girondist party. On the fall of her husband she was arrested, and was executed Nov. 8, 1793. Her *Mémoires and Letters* have been published.

Rolfe, WILLIAM JAMES, Shakespearean editor, was born at Newburyport, Massachusetts, in 1827. He became noted as a Shakespearean scholar, and published valuable annotated editions of Shakespeare's plays, also editions of the works of various English poets, etc., also wrote *Cambridge Course of Physics*, *Life of Shakespeare*, etc.

Rolland (rō'län'), ROMAIN (1866-), a French author, born at Clamecy, Department of the Nièvre, France. His best known work is *Jean Christophe*, a three-volume novel whose central character is a musical genius. It has been translated into several languages. He was a lover of peace and when the war broke out in 1914 he wrote *Au dessus de la Mêlée* ('Above the Battle'). This book, which lacked the martial spirit, was coldly received by his former admirers, and he left France to reside in Switzerland. In 1915 he received the Nobel prize for literature. He wrote a history of European opera and biographies of Haendel, Millet, etc.

Roller (rōl'er; *Coracias*), a genus of fissirostral insessorial birds, generally of small size. The common roller (*Coracias garrŭla*) is found in Europe as a summer visitor, though Africa appears to be its native country. In size the roller averages the common jay. The plumage is in general an assemblage of blue and green, mixed with white, and heightened by the contrast of more somber colors. The voice is noisy and harsh.

Roller Skate, a wheeled skate suitable for use on smooth pavements or floors. The earliest skate of this kind was patented in France in 1819. Roller skating became a favorite amusement in England in 1864 and in the United States in 1866. Since then there have been several periods of roller skate popularity.

Rollin (rol-aṇ), CHARLES, a French historian, born at Paris in 1661, studied theology, obtained a chair in the Collége de France, and later was a rector of the University of Paris. He died in 1741. His *Ancient History* was long popular in English, but is now quite out of date.

Rolling-mill, a combination of machinery used in the manufacture of malleable iron and other metals of the same nature. It consists of one or more pairs of iron rollers, whose surfaces are made to revolve nearly in contact with each other, while the heated metal is passed between them, and thereby subjected to a strong pressure. The first rolling is to expel the scoriæ and other impurities, after which the mass of metal is cut into suitable lengths, which are piled on one another and reheated, when the mass which has been partially fused is again passed through the rollers. This second rolling determines its form into a hoop, rail, bar, or plate according to the form given to the surfaces of the rollers. See *Iron*.

Rolls, MASTER OF THE. See *Master of the Rolls*.

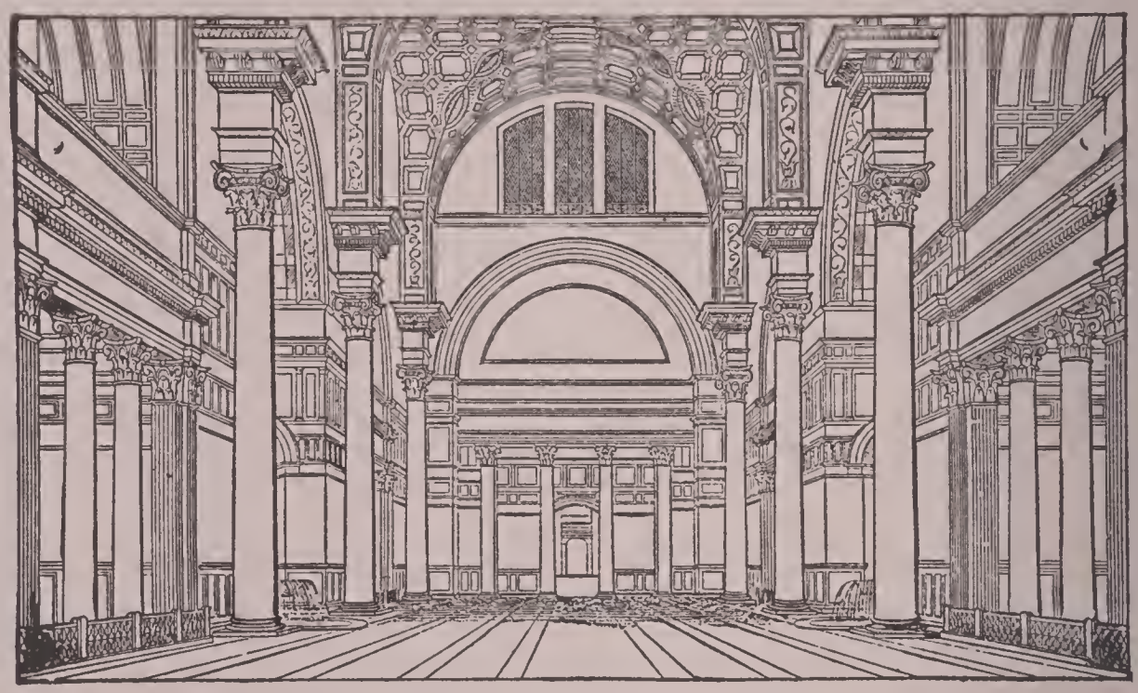
Rolls Series, the series of English publications issuing from the Record Office under the control of the master of the rolls. It comprises most of the chief English chronicles and many highly important historical documents.

Romagna (rō-mȧn'yȧ), formerly the northeastern portion of the Papal States, embracing the provinces of Ferrara, Bologna, Ravenna, and Forli.

Romaic. See *Greece* (*Modern*).

Roman Architecture, the style of building practiced by the ancient Romans. Derived on the one hand from the Etruscans, and on the other from the Greeks, the fusion ultimately resulted in an independent style. Its essential characteristics are, the employment of the Tuscan and the Composite order, and the introduction and free use of the semicircular arch and arcade, together with the use of rounded and prominent moldings, often profusely decorated. In Roman architecture the great feature is the em-

ployment of the arch as well as the lintel, while Greek architecture employs the lintel only. It produced various constructions, unknown to Greek art, such as amphitheaters, circuses, aqueducts, bridges, baths, triumphal arches, etc. It has thus been of vastly greater practical utility than the Greek, and is bold and imposing in appearance. The column as a support, being no longer exclusively a necessity, was often of a purely decorative character, and was largely used in front of closed walls, in domes above circular interiors, and in the construction of cylindrical and groined vaulting over oblong spaces. The arch was freely used internally as well as externally, and became an important decorative feature of interiors. The Roman



Roman Architecture.— Great Hall in the Baths of Caracalla.

temples, as a rule, from the similarity of the theogony to that of the Greeks, were disposed after the Greek form, but a purely Roman type is seen in the circular temples such as the Pantheon at Rome, the temple of the Sibyl at Tivoli, the temple of Vesta at Rome, etc. This style of architecture was introduced by the Romans into all their colonies and provinces — vast existing remains evidencing the solid character of the buildings. It reached its highest stage during the reign of Augustus (B.C. 27), and after the translation of the seat of empire to Byzantium it degenerated and ultimately gave place to a debased style.

Roman Candle, a kind of firework consisting of a tube which discharges in rapid succession a series of colored stars or balls.

Roman Catholic Church, that society of Christians which acknowledges the Bishop of Rome as its visible head. The foundation of the Christian Church at Rome is uncertain, but St. Paul did not visit Rome until after he had written his *Epistle to the Romans.* The claim to supremacy on the part of the Bishop of Rome is based on the belief that our Lord conferred on Peter a primacy of jurisdiction; that that apostle fixed his see at Rome; and that the bishops of Rome, in unbroken succession from Peter, have succeeded to his prerogative of supremacy. The distinctive character of the Church is the supremacy of the papacy. Its doctrines are to be found in the Apostles' creed, the Nicene creed, the Athanasian, and that of Pius IV. The latter added the articles on transubstantiation, invocation of saints, and others which chiefly distinguish the Roman from other Christian communities. The dogmas of the immaculate conception of the Virgin Mary and papal infallibility are recent additions. Roman Catholics believe that the mass is the mystical sacrifice of the body and blood of Christ, that the body and blood are really present in the eucharist, and that under either kind Christ is received whole and entire. They also believe in purgatory, that the Virgin Mary and the saints are to be honored and invoked, and that honor and veneration are to be given to their images. Seven sacraments are recognized, viz.: Baptism confirmation, the holy eucharist, penance,

extreme unction, holy orders, and matrimony. A hard-and-fast line in matters relating to the faith is drawn between what is of doctrine and what of discipline. Doctrine is what was taught by Christ and his disciples; discipline, different rules, laid down by the councils, for the government of the church, the administration of sacraments, and the observances and practices of religion. Fasting and penance form part of the discipline. The clergy of the church in the west are bound by a vow of celibacy taken at their ordination as subdeacons. The clergy of those Greek and Armenian churches that are united in communion with the see of Rome may receive orders if married, but may not marry after ordination. Under the generic name of Roman Catholics are comprised all churches which recognize the supremacy of the Pope of Rome, including the United Greeks, Slavonians, Ruthenians, Syrians, Copts and Armenians. The supreme council or senate of the Roman Church is the college of cardinals, 70 in number, who are the advisers of the sovereign, and, on the death of the pontiff, elect his successor. The total number of members of the Roman Catholic Church has been estimated at 270,000,000, about 5,600,000 being in Great Britain and Ireland. The number of Roman Catholics in the United States is over 16,000,000. In Canada the members of the Roman Catholic Church number 2,000,000. See also such articles as *Catholic Emancipation*, *Conception* (*Immaculate*), *Infallibility*, *Mass*, *Orders* (*Religious*), *Popes*, *Papal States*, *Saints*, etc.

Roman Cement, a dark-colored hydraulic cement, which hardens very quickly and is very durable. The true Roman cement is a compound of pozzuolana and lime ground to an impalpable powder and mixed with water when used. Other cements bearing the same name are made of different ingredients. See *Cements*.

Roman Law. See *Civil Law*.

Roman Literature. See *Rome*.

Roman Numerals. See *Arithmetic*.

Roman Roads, certain ancient roads in Britain which the Romans left behind them. They were uniformly raised above the surface of the neighboring land and ran in a straight line from station to station. The four great Roman roads were Watling Street, the Fossway, Icknield Street, and Ermine Street. Watling Street probably ran from London to Wroxeter. The Foss ran from Seaton in Devonshire to Lincoln. The Icknield Way ran from Iclingham, near Bury St. Edmunds, to Cirencester and Gloucester. The Ermine Street ran through the Fenland from London to Lincoln. Besides these four great lines, which were long of great importance for traffic, there were many others. For usual plan of Roman roads see *Appian Way*.

Roman Walls, certain walls or ramparts in Britain constructed by the Romans. The most celebrated of these is the wall built by Hadrian (120 A.D.) between the Tyne and the Solway. It was further strengthened by Severus, and hence is often called the wall of Severus. In 139 Lollius Urbicus built a second wall or northern rampart between the Forth and the Clyde, which occupied the same line as the chain of forts built by Agricola (A.D. 80–85). It is known as the wall of Antoninus. These walls formed the northern boundaries of the Roman dominions in Britain, and were built to prevent the incursions of the Picts and Scots. See *Antoninus, Wall of; Severus, Wall of*.

Romance (ro-mans′), a fictitious narrative in prose or verse, the interest of which turns upon incidents either marvelous or uncommon. The name is derived from the class of languages in which such narratives in modern times were first widely known and circulated: these were the French, Italian, and Spanish, called the *Romance Languages* (which see). (For the distinction between *romance* and *novel* see the article *Novel*.) The earlier mediæval romances of Western Europe were metrical, and may be divided into two classes — the popular epics chanted by strolling minstrels, and the more elaborate and artificial poems composed and sung by the court poets. Both classes were based on more ancient lays treating of celebrated heroes, frequently mingled with pagan myths, and with connecting passages composed by the reciters. Hence originated a series of epics grouped around some renowned hero, and forming a cycle of romance. The romances of French origin (*chansons de geste*) form a large and interesting body of literature. Some of them reach a greater length than 20,000 lines. These romances were sung by wandering minstrels (*jongleurs*) to the sound of a kind of violin (*vielle*). Many of the reciters wrote their own chansons, while others bought copies from the original composers. The *chansons d-*

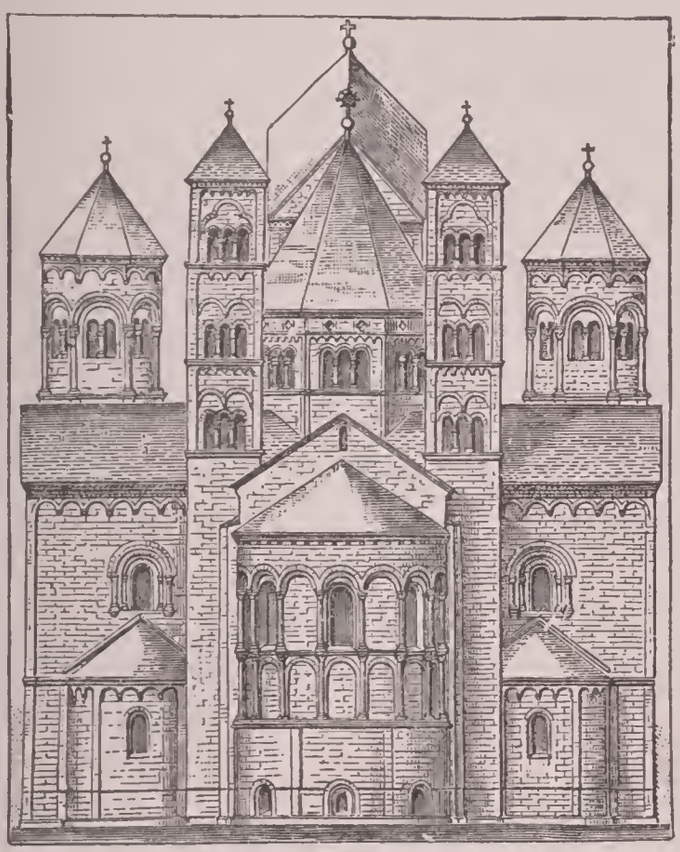
geste are divided into three cycles — that relating to Charlemagne and his peers; the Arthurian, or that concerned with King Arthur and his knights; and the classical, dealing with Troy, Alexander the Great, etc. The oldest is the *Chanson de Roland*, dating from the eleventh century and treating of the deeds of Charlemagne's nephew Roland. *Ferabras* or *Fierabras*, dating from the beginning of the thirteenth century, belongs to the same cycle. Other chansons worthy of mention are: *Ogier le Danois*, written about the beginning of the thirteenth century; *Renaud de Montauban*, composed in the thirteenth century; *Huon de Bordeaux* (twelfth century); *Beuves d'Hanstonnes* (thirteenth century, the British *Bevis of Hampton*). The romances of the Arthurian cycle owe their origin to the lays of the Welsh bards, supposed to be as old as the sixth and seventh centuries, but they are directly based on the *Latin History* of Geoffrey of Monmouth, which was versified in French by Wace (1155–58) and amplified and translated into English by Layamon about 1204. One of the most prolific of Arthurian poets is Chrétien de Troyes (born about 1140). His poem *Li Chevalier au Lyon* is the *Ywain and Gawain* in Ritson's English Metrical Romances. Another poem belonging to this cycle is the *Morte d'Arthur* (fourteenth century). The Arthurian romance spread from France to Provence, Spain, Italy, and the Netherlands, and was again transplanted into England. The most important romance of the classical cycle is *Le Romans d' Alixandre*, written by Lambert li Tors and Alixander de Bernay in the twelfth century; it contains upwards of 20,000 twelve-syllable lines. This chanson first brought the Alexandrine line into vogue and gave it its name. The English *Kyng Alisaunder*, in 8034 eight-syllable lines, dates from the fourteenth century. The chief poem of the Trojan section is the *Troie* of Benoist de St. More, an Anglo-Norman poet of the twelfth century. This chronicle consists of upwards of 30,000 octosyllabics, and was translated into Dutch and German verse in the thirteenth century. Founded upon it was the Latin *Historia Trojana* of Guido de Colonna, which was translated into most European languages. It was turned into English and Scotch verse no fewer than four times. The most celebrated of these is Lydgate's *Troye-Boke* (1414–20). Besides the romances dealing with the subjects mentioned, we find also a class in which exploits of Teutonic heroes are celebrated, as the Anglo-Saxon or Anglo-Danish *Beowulf*, the old German *Nibelungenlied*, the romance of *Havelok the Dane*, etc. The poetical romance was superseded by the prose romance, the transformation of metrical into prose romances being partly due to the invention of the art of printing, by which the advantage of meter for purposes of recital was superseded. The prose narratives, like those in verse, celebrated Arthur, Charlemagne, Amadis de Gaul, and other heroes of chivalry. The word is used in modern times to signify stories of adventure.

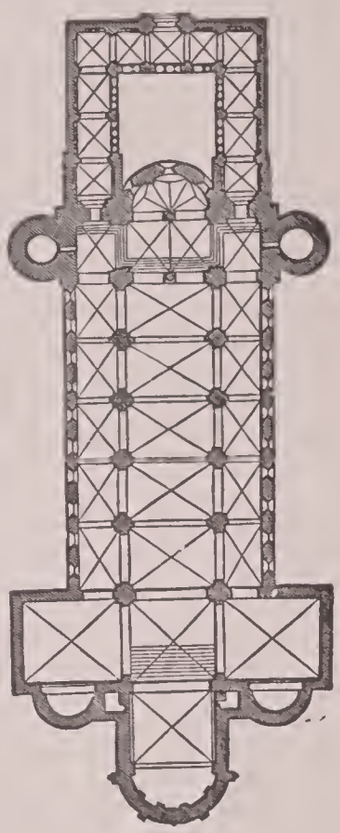
Romance Languages, those languages of Southern Europe which owe their origin to the language of Rome —the Latin— and to the spread of Roman dominion and civilization. They include the Italian, French, Provençal, Spanish, Portuguese, Roumanian, and Romansch. Their basis was not, however, the classic Latin of literature, but the popular Roman language — the *Lingua Romana rustica* spoken by the Roman soldiers, colonists, and others, and variously modified by uneducated speakers of the different peoples among whom it became the general means of communication. In all of these tongues Latin is the chief ingredient, and a knowledge of Latin helps very greatly in acquiring a knowledge of them.

Romanes (rō-man'ez), GEORGE JOHN, biologist, born at Kingston, Canada, in 1848; died in 1894. He was educated at Cambridge University, became Fullerian professor in the Royal Institution, London, and in 1890 removed to Oxford, where he founded a Romanes lectureship. In scientific views he was an advanced Darwinian, giving his ideas on this subject in *Darwin and After Darwin*. He also wrote *Mental Evolution, Animal Intelligence, etc.*

Romanesque Architecture (rō-man-esk'), a general and rather vague term applied to the styles of architecture which prevailed in Western Europe from the fifth to the twelfth century. The Romanesque may be separated into two divisions: (*a*) the debased Roman, in use from the fifth to the eighth century; and (*b*) the later Romanesque of the eighth to the twelfth century, which comprises the Lombard, Rhenish or German and Norman styles. The former is characterized by a pretty close imitation of the features of Roman, with changes in the mode of their application and distribution; the latter, while based on Roman form, is Gothic in spirit, has a predominance of vertical lines, and intro-

duces a number of new features and greatly modifies others. To the former belong especially churches of the basilica type (see *Basilica*) in various cities of Italy, as also a number of circular churches, and many of these buildings have a certain affinity to the Byzantine type of architecture. (See *Byzantine.*) The semicircular arch is used throughout the entire period, and the general expression of the buildings is rather severe. It assumes different phases in different countries. In Romanesque churches of the ninth and the eleventh century the prevailing features are: that in plan the upper limb of the cross is short and terminated by a semicircle or semi-octagonal apse; the transepts frequently short and often rounded externally; the walls very thick, without buttresses or with buttresses having very slight projection; the pillars thick, sometimes simply cylindrical or clustered in large masses, and either plain or with but simple decoration; the capitals of cushion form, sometimes plain, at others enriched with various ornaments peculiar to the style. Externally, roofs of moderate pitch, towers square or octagonal, low or of moderate elevation, and with terminations of pyramidal character; windows round-headed and without mullions; doorways moderately recessed and highly decorated with the cable, chevron, and other distinctive ornaments; arcades much employed for decoration, frequently by a continuous series round the upper part of the apse and round the upper parts of transepts also, when the transepts are rounded externally. The principal front is frequently flat and decorated with arcades in successive rows from the apex of the roof till just above the portals, producing a rich effect, as at Pisa Cathedral. See *Lombard Architecture* and *Norman Architecture*, and the general article *Architecture.*





End View and Plan of Romanesque Church of Laach (Rhenish Prussia).

Romanesque Ornament.

Romano (rō-mä′nō), GIULIO. See *Giulio Romano.*

Romans (ro-mäṇ), a town of S. E. France, dep. Drôme, 10 miles northeast of Valence, picturesquely situated on the Isère. It has walls flanked with towers, an interesting church, and manufactures of cottons, etc. Pop 13,222.

Romans (rō'manz), EPISTLE TO THE, the most elaborate, and, in a doctrinal point of view, the most important composition of St. Paul. It sets forth that the gospel doctrine of justification by faith is a power unto salvation to all men, both Jews and Gentiles. The writer then deplores the rejection of the Jews, and in the practical part admonishes the Romans to exercise the various gifts bestowed upon each in a spirit of love and humility; he especially urges the strong to bear with the weak, and concludes with various salutations and directions. In modern times doubts have been thrown upon the authenticity of the concluding portion of this epistle, some critics regarding the whole of chapter xvi, as spurious.

Romansch (rō-mansh'), RUMONSCH, one of the Romance family of languages, spoken in parts of Switzerland (Grisons), the Tyrol, etc. In some parts it is known as the *Ladin*, that is Latin, which forms the basis of it. The literature is mainly religious.

Romantic (rō-man'tik), a term used in literature as contradistinguished to *antique* or *classic*. The name *romantic school* was assumed about the beginning of the nineteenth century by a number of young poets and critics in Germany, the Schlegels, Novalis, Tieck, etc., whose efforts were directed to the overthrow of the artificial rhetoric and unimaginative pedantry of the French school of poetry. The name is also given to a similar school which arose in France between twenty and thirty years later, and which had a long struggle for supremacy with the older *classic school*. Victor Hugo, Lamartine, etc., were the leaders.

Rome (rōm; Latin, ROMA), the most famous nation of ancient times, originally comprising little more than the city of Rome (see next article), later an empire embracing a great part of Europe, Northern Africa, and Western Asia. The origin of Rome is generally assigned to the year 753 B.C., at which time a band of Latins, one of the peoples of Central Italy, founded a small town on the left bank of the Tiber, about 15 miles from the sea, the population being subsequently augmented by the addition of Sabines and Etruscans. The weight of tradition places it beyond doubt that in the earliest period the government of Rome was an elective monarchy, the king being chosen by an assembly of *patres* (fathers) or heads of families who formed the senate. According to tradition these kings were seven in number, their names and traditional reigns being as follows: Romulus, 753–716 B.C.; Numa Pompilius, 715–676; Tullus Hostilius, 674–642; Ancus Martius, 642–618; L. Tarquinius Priscus, 618–578; Servius Tullius, 578–534; and Tarquinius Superbus, 534–509. The last three were of Etruscan origin, pointing to a temporary supremacy at least of Etruria over Rome.

From the commencement of Roman history the people are found divided into two classes, the *patricians* or aristocracy (a kind of oligarchy), and the *plebeians* or common people, besides a class called *clients*, immediate dependents of the patricians. All political power was in the hands of the patricians. All matters of importance had to be laid before them in their *comitia curiata* or assembly, in which they voted by divisions called *curiæ*. (See *Comitia*.) From and by them also were elected the members of the senate or council of the elders, as it may be called, which advised the king. By reforms instituted by Servius Tullius the way was at least prepared for altering this state of affairs. He introduced a division of all the people, according to their property, into five *classes*, and these again into *centuries*. With the first or highest class was sometimes reckoned a body called *equites* or horsemen, but these were sometimes regarded as above all the classes. The lowest section of the people, called *proletarii*, were sometimes reckoned as a sixth class, and sometimes as forming part of the fifth. Thus originated a new assembly, the *comitia centuriata*, which included plebeians as well as patricians, though the latter had the great preponderance. The plebeians got also an assembly of their own with certain limited powers, the *comitia tributa*, in which they met by local divisions called tribes.

The last of the kings, Tarquinius Superbus, by his tyrannical government excited the hatred of all classes, and this was raised to the highest pitch by an act of violence perpetrated by his youngest son Sextus. (See *Lucretia*.) The people then rose in rebellion, and abolished forever the kingly government (509 B. C.). Upon the expulsion of the kings the royal power was intrusted to one man who held it for a year, and was called *dictator*. Afterwards two yearly officers, called at first *prætors*, afterwards *consuls*, wielded the highest executive power in the state both in civil and military affairs.

Almost all political power still remained with the patricians, however, and for more than 200 years the internal history of Rome is mainly composed of the

CAPTURE AND SACK OF ROME BY ALARIC, KING OF THE GOTHS, 410 A. D.

In the pillage of Rome a just preference was given to gold and jewels, which contain the greatest value in the smallest compass and weight.

endeavors of the plebeians to place themselves on a political equality with the patricians. In 494 B.C. the plebeians succeeded in securing a measure of justice. Two magistrates called *tribunes* were chosen from the ranks of the plebeians. Their persons were inviolable; and they had the right of protecting every plebeian against injustice on the part of an official. Later they were admitted to the senate, where they had the right of vetoing resolutions and preventing them from becoming law. Their number was afterwards increased to five, and finally to ten. The tribunes, through ignorance of the laws, which were kept secret by the patricians, were often thwarted in their endeavors to aid the plebeians. The plebs demanded the publication of the laws, and at last the senate yielded. It was agreed that in place of the regular magistrates ten men (*decemviri*) should be nominated, with unlimited power to govern the state and prepare a code of written laws. These men entered on office in 451 B.C., and in the first year of office they had compiled ten tables of laws, and to these in the second year they added other two tables, making up the famous *Laws of the Twelve Tables.* But when the second year had elapsed, and the object for which they had been appointed was accomplished, they refused to lay down their office, and were only forced to do so by an insurrection. The immediate occasion of this rising was, according to the well-known story made popular by Macaulay in his lay of *Virginia*, an act of infamy attempted by one of the ten. (See *Appius Claudius.*) After the overthrow of the decemvirate two chief magistrates were reappointed, but the title was now changed from prætors to consuls (449 B.C.). In 444 another change was made by the appointment of military tribunes with consular power (from three to six or even eight in number), who might take the place of the consuls. To this office both classes of the community were eligible, although it was not till 400 B.C. that a plebeian was actually elected. In 443 B.C. a new patrician office, that of *censor*, was created. (See *Censor.*) No plebeian was censor till 351 B.C.

During this period of internal conflict Rome was engaged in defensive wars, chiefly with the Æquians and Volscians, who lived close by. With these wars are connected the legends and traditions of Coriolanus, the extermination of the Fabii, and the saving of the Roman army by Cincinnatus. (See *Coriolanus, Fabii,* and *Cincinnatus.*) Towards the end of the fifth century B.C., after extending her territory to the south, Rome turned her arms against Etruria in the north. For ten years (405–396) the important city of Veii is said to have been besieged, till in the latter year it was taken by Camillus, and the capture of this city was followed by the submission of all the other towns in the south of Etruria. But just at this point Rome was thrown back again by a total defeat and rout on the banks of the Allia, a small stream about 11 miles N. of Rome, and the capture and destruction of the city by the Gauls in 390 B.C. After the Gauls retired with their booty the city was hastily reconstructed, but the destitution and suffering of the people rendered domestic tranquillity impossible. After a struggle, however, the Licinian laws were adopted in 367, the plebeians being now admitted to the consulship, and a fairer distribution of public lands being brought about.

During the period 343–264 Rome was engaged in many important wars, the chief of which were the four Samnite wars, the great Latin war, the war with the Greek cities of Southern Italy, and the war with Pyrrhus, the invader of Italy from Greece. The chief events of this protracted struggle were the defeat of the Romans by the Samnites under Pontius at the Caudine Forks, and the passing of the Romans under the yoke in acknowledgment of their subjugation (321 B.C.); the defeat of the Samnites, Umbrians, Etruscans, and Gauls at Sentinum (295 B.C.); and the final defeat of Pyrrhus at Beneventum (275 B.C.). In 272 B.C. the city and fortress of Tarentum surrendered to the Romans, and the defeat of the Sallentini in Calabria (266) made the Romans masters of all Italy south of the Rubicon and Macra.

Rome, having had leisure to conquer Italy, now felt at liberty to contend for the possession of Sicily, at this time almost entirely under the dominion of the great maritime power of Carthage. An opportunity for interfering in Sicilian affairs was easily found, and in 264 B.C. the First Punic or Carthaginian war began. It lasted for more than twenty years, caused the loss of three large fleets to the Romans, and the defeat of a Roman army under Regulus in Africa; but in 241 a great victory over the Carthaginian fleet caused the latter power to sue for peace. This was finally concluded on the conditions that Carthage should give up Sicily, and pay a great sum as a war indemnity. The larger western part of Sicily became the *first Roman province;* the smaller eastern

part continued under the supremacy of the Greek city Syracuse, which was allied to Rome. The sway of Rome was also extended over all the islands which Carthage had possessed in the Mediterranean. About the same time the Romans wrested the island of Corcyra (Corfu) and some coast towns from the piratical Illyrians. From 226 to 222 B.C. they were engaged in a more difficult war with the Gauls inhabiting the Po basin; but the Romans were again successful, and the Gallic territory was reduced to a Roman province under the name of Gallia Cisalpina (Gaul on this side the Alps).

Meanwhile the Carthaginians had been making considerable conquests in Spain, which awakened the alarm and envy of the Romans, and induced them to enter into a defensive alliance with the Greek colony of Saguntum, near the east coast of that country. In 221 B.C. Hannibal, the son of Hamilcar Barca, who had bravely and skilfully maintained the Carthaginian arms in Sicily, and had afterwards founded and in great part established a Carthaginian empire in Spain, succeeded to the command of the Carthaginian forces. The taking of Saguntum, a city allied to Rome, occasioned the second Punic war, during which Hannibal traversed Gaul, crossed the Alps, and invaded Italy. The war continued in Italy for fifteen years (218–204 B.C.); and was carried on with consummate generalship on the part of Hannibal, who inflicted on the Romans one of the most disastrous defeats they ever sustained, at Cannæ, in 216 B.C. This great man was ill supported by his country, and the war terminated in favor of the Romans through the defeat of Hannibal by P. Cornelius Scipio at Zama in Africa in 202 B.C. (See *Hannibal.*) One of the results was that the power of Carthage was broken and Spain practically became a Roman possession. Upper Italy was also again subjugated, and Transpadane Gaul acquired. A third Punic war broke out on slight pretext in 149 B.C., and ended in 146 in the capture of Carthage by Scipio (the younger) after a severe struggle, and the conversion of the Carthaginian territory into the province of Africa.

Philip V of Macedonia had favored Hannibal, and thus gave Rome a pretext to mix in Grecian affairs. The result was that Macedonia was made a Roman province (148 B.C.), while in the same year that Carthage fell Corinth was sacked, and soon after Greece was organized into the province of Achaia. (See *Greece.*) Previously Antiochus the Great of Syria had been defeated by the Romans (190 B.C.) and part of Asia Minor brought into vassalage to Rome. In the east Rome intrigued where she could, and fought when she was compelled, and by disorganizing states made them first her dependencies and then her provinces. In 130 B.C. she received by bequest the dominions of Attalus III of Pergamus (Mysia, Lydia, Caria, and Phrygia), which was formed into the province of Asia.

By this time strife between different classes within Rome again began to be bitter, but it was now not between patricians and plebeians, but between rich and poor. The conquests which had been made, and the lucrative posts which were now to be had, as well as the wide field generally available for money-making, had produced a wealthy privileged class partly consisting of patricians, partly of plebeians, without benefiting the other classes of the citizens. The agrarian laws which formerly protected the people were generally unobserved, great landed estates were accumulated in few hands, and the cultivation of the land by swarms of slaves left war the only occupation of the citizens. Thus vast numbers of the middle class of citizens were reduced to absolute want, and driven from their homes. To remedy this the two Gracchi, Tiberius and Caius, successively proposed measures for the better distribution of the land, and in general for the relief of the destitute classes. They thus incurred the violent hatred of the nobles or men of position, and both of them lost their lives in the party struggles that ensued (in 133 and 121 B.C. respectively).

Previously to this the Romans had formed an alliance with the Greek colony of Massilia (Marseilles), and in aid of their allies they were twice called in to quell the neighboring Gallic tribes (first in 154 B.C., and next in 125 B.C.). On the second occasion, after putting down the Gauls (125–123) they kept possession of the conquered country, and made this part of Gaul a Roman province (Provincia Gallia — Provence). The next war was in Africa, with Jugurtha, who had usurped the throne of Numidia, and against whom the assistance of Rome had been asked. It was brought to an end by Caius Marius, who had risen from an obscure rank to the consulship (104 B.C.). Marius also repelled invasions of the province of Gaul by the Cimbri and Teutones in 102–101 B.C. A serious war, almost of the nature of a civil war, followed with the Roman allies in Italy, who rose in 90 B.C. to demand the right

of equal citizenship with the people of Rome. This war, known as the Social war, lasted for two years (90–88 B.C.), and ended in the victory of the Romans, who, however, found it advisable to concede the franchise to the Italian tribes to prevent another rising.

This war had been concluded by Sulla, between whom and Marius great rivalry prevailed; and now sprang up the first Roman civil war, a struggle between the party of Marius (the people) and that of Sulla (the nobles). Sulla, the consul for 88, was on the point of starting for Asia to attack Mithridates, king of Pontus, a war that promised both glory and treasure. Marius was eager for the same command, and through intrigue on his behalf the populace deprived Sulla of the chief command and gave it to Marius. Thereupon, Sulla marched on Rome with his legions, forced Marius to flee to Africa, and then proceeded to the Mithridatic war. In his absence Marius returned, wreaked a bloody vengeance on the partisans of his rival, and died after being appointed consul for the seventh time (86 B.C.). Three years later Sulla came back from Asia, having brought the Mithridatic war to a satisfactory conclusion, and now felt himself at liberty to take his revenge on the Marian party for the atrocities of which it had been guilty towards his own party in his absence; and he took it in full measure. Four thousand of his opponents he caused to be massacred in the circus in one day; and then got rid of all the chief men of the democratic party by proscription. He was now appointed dictator for an unlimited term (81 B.C.), and as such passed a series of measures the general object of which was to restore to the constitution its former aristocratic or oligarchical character. In the beginning of 79 B.C. Sulla retired into private life, and he died in the year following.

The man who now came most prominently before the public eye was Pompey, one of Sulla's generals. His first important achievement was the subjugation of the remnant of the democratic or Marian party that had gathered round Sertorius in Spain (76–72 B.C.). On his return to Italy he extinguished all that remained of an insurrection of slaves, already crushed by Crassus (71), and in 70 B.C. was consul along with Crassus. In 67 B.C. he drove the pirates from the Mediterranean, and afterwards reduced Cilicia, which he made into a Roman province. He was then appointed to continue the war that had been renewed against Mithridates, king of Pontus, whom he finally subdued, forming part of his dominions in Asia Minor into a Roman province, and distributing the rest among kings who were the vassals of Rome. In 64 B.C. Pompey put an end to the dynasty of the Seleucidæ in Syria, and converted their kingdom into a province, and in 63 B.C. advanced southwards into Judea, which he made tributary to Rome. All these arrangements were made by him on his own authority. In the very year in which they were completed a member of the aristocratic party, the great orator Cicero, had earned great distinction by detecting and frustrating the Catilinarian conspiracy. (See *Catiline.*)

Only three years after these events (60 B.C.) a union took place at Rome of great importance in the history immediately subsequent. Caius Julius Cæsar, a man of aristocratic family who had attached himself to the democratic party and had become very popular, joined Pompey and Crassus in what is called the *first triumvirate*, and practically the three took the government of Rome into their own hands. On the part of Cæsar, who was now elected consul, this was the first step in a career which culminated in the overthrow of the republic, and his own elevation to the position of sovereign of the empire. After the death of Crassus (53 B.C.) came a struggle for supreme power between Cæsar and Pompey. Cæsar had gained great glory by the conquest of Gaul, but now at Pompey's instigation was called on to resign his command and disband his army. Upon this he entered Italy, Pompey fled into Greece, and the short civil war of 49–48 B.C., and the great battle of Pharsalia in the latter year, decided the struggle in Cæsar's favor. Pompey's army was utterly routed; he himself was compelled to flee, and having gone to Egypt was there murdered. In a short time Cæsar utterly subdued the remains of the Pompeian party and became virtually king in Rome though he did not assume the title. Cæsar was assassinated by republicans in 44 B.C., and the main result of the conspiracy by which he fell was that the first place in Rome had again to be contested. The competitors this time were Octavianus, the grand-nephew and adopted son of Cæsar, then only nineteen, and Mark Antony, one of Cæsar's generals. In 43 B.C. these two formed with Lepidus what is known as the *second triumvirate;* and after avenging the death of Cæsar and putting an end to the republican party in the battle of Philippi (42), Octavian and Antony, casting off Lepidus, who was a weakling, divided the empire between them, the former taking

Rome and the West and the latter the East. In ten years, in consequence of Antony's obsession by Cleopatra of Egypt, war broke out between the two, and in the naval battle of Actium (31 B.C.) Antony was defeated, and the whole Roman world lay at the feet of the conqueror, Egypt being also now incorporated. Not long after this Octavian received the title of Augustus, the name by which he is known in history as the first of the Roman emperors.

In his administration of the empire Augustus acted with great judgment, ostensibly adhering to most of the republican forms of government, though he contrived in course of time to obtain for himself all the offices of highest authority. The reign of Augustus is chiefly remarkable as the golden age of Roman literature, but it was a reign also of conquest and territorial acquisition. Before the annexation of Egypt Pannonia had been added to the Roman dominions (35 B.C.), and by the subsequent conquest of Mœsia, Noricum, Rhætia, and Vindelicia, the Roman frontier was extended to the Danube along its whole course. Gaul and Spain also were now finally and completely subdued. The empire of Augustus thus stretched from the Atlantic to the Euphrates, and from the Rhine and the Danube to the deserts of Africa. This emperor died in 14 A.D. His reign is above all memorable for the birth of Christ in B.C. 4.

Augustus was followed by a series of emperors forming, when he and Julius Cæsar are included, the sovereigns known as the *Twelve Cæsars*. The names of his successors and the dates of their deaths are: Tiberius, 37 A.D.; Caligula, 41; Claudius, 54; Nero, 68; Galba, 69; Otho, 69; Vitellius, 69; Vespasian, 79; Titus, 81; and Domitian, 96. Most of these were sensual and bloodthirsty tyrants, Vespasian and his son Titus being the chief exceptions. Vespasian's reign was noted for the taking and destruction of Jerusalem; that of Titus for the destruction of the cities of Pompeii and Herculaneum by an eruption of Vesuvius (A.D. 79). After Titus his tyrannical brother Domitian reigned till his death by assassination in A.D. 96, when an aged senator, Nerva, was proclaimed as his successor.

Nerva's reign was short (96–98) but beneficent, and he was followed by four emperors, Trajan, Hadrian, Antoninus Pius and Marcus Aurelius, who together reigned for more than eighty years, and under whom the countries making up the Roman Empire enjoyed in common more good government, peace, and prosperity than ever before or after. Trajan (98–117) was a warlike prince, and added several provinces to the Roman Empire. Hadrian (117–138), the adopted son of Trajan, devoted himself entirely to the internal affairs of his empire. It was in his reign that the southern Roman wall, or rampart between the Tyne and the Solway Firth, was erected. Antoninus Pius (138–161) was likewise the adopted son of his predecessor. In his reign the northern wall in Britain, between the Forth and Clyde, was constructed. The next emperor, Marcus Aurelius (161–180), was both the son-in-law and the adopted son of Antoninus Pius. He combined the qualities of a philosopher with those of an able and energetic ruler.

Commodus (180–192), the son and successor of Aurelius, inherited none of his father's good qualities, and his reign, from which Gibbon dates the decline of the Roman Empire, presents a complete contrast to those of the five preceding emperors. During his reign an era of military despotism ensued. The prætorian guard (the imperial body-guard) became virtually the real sovereigns, while the armies of the provinces declared for their favorite officers, and the throne became the stake of battle. In the long list of emperors who succeeded may be noted Septimius Severus, who reigned from 193 to 211, during which time he restored the empire to its former prestige. He reconquered Mesopotamia from the Parthians, but in Britain he confined the Roman province to the limit of Hadrian's Wall, which he restored. He died at York. Alexander Severus, who reigned from 222 till 235, was also an able ruler, and was the first emperor who openly extended his protection to the Christians. His death was followed by a period of the greatest confusion, in which numerous emperors, sometimes elected by the senate, sometimes by the soldiers, followed one another at short intervals, or claimed the empire simultaneously. This period is known as the era of the Thirty Tyrants. Meanwhile the empire was ravaged on the east by the Persians, while the German tribes and confederations (Goths, Franks, Alemanni) invaded it on the north. The empire was again consolidated under Aurelian (270–275), who subdued all the other claimants to the imperial dignity, and put an end to the Kingdom of Palmyra, which was governed by the heroic Zenobia.

The reign of Diocletian (284–305) is remarkable as affording the first example of that division of the empire which ultimately led to the formation of the empire of the West and the empire of the East. Finding the number of the barbarian

violators of the Roman frontier too great for him he adopted as joint-emperor Maximian; and in 292 each of these associated with himself another, to whom the title of Cæsar was allowed. Diocletian took Galerius, and Maximian his son-in-law, Constantius Chlorus. These four now divided the empire between them. Diocletian assumed the government of the East with Thrace, allotting to Galerius the Illyrian provinces; Maximian assumed Italy, Africa, and the islands of the Mediterranean; and left to Constantius Spain, Gaul, and Britain. This arrangement temporarily worked well, but in 323 Constantine, the son of Constantius, was left sole master of the empire.

Ever since the time of Augustus and Tiberius, Christianity had been spreading in the Roman Empire, notwithstanding terrible persecutions. The number of churches and congregations had increased in every city; the old mythologic religion had lost its strength, very few believing in it: as a result Constantine deemed it expedient to make the Christian faith the religion of the empire. He also removed the seat of government from Rome to Byzantium, which was given the name of Constantinople (330), and completely reorganized the imperial administration. Constantine died in 337. The empire was left among his three sons, of whom Constantius became sole ruler in 353.

The next emperor, Julian the Apostate, sought to restore the old religion, but in vain. He was an able ruler, but fell in battle against the Persians in 363. He was succeeded by Jovian, who reigned less than one year; and after his death (364) the empire was again divided, Valens (364–378) obtaining the eastern portion, and Valentinian (364–375) the western. From this division, which took place in 364, the final separation of the eastern and western empires is often dated. In the reigns of Valens and Valentinian great hordes of Huns streamed into Europe from the steppes of Central Asia. After subduing the Eastern Goths (Ostrogoths) they attacked those of the west (Visigoths); but these, since they had already been converted to Christianity, were allowed by Valens to cross from the left to the right bank of the Danube, and settle in Mœsia. In their new homes they found themselves exposed to the oppression and rapacity of the Roman governors, and when they could no longer brook such treatment they rose in rebellion, and defeated Valens in the sanguinary battle of Adrianople, in the flight from which the emperor lost his life (378). His son Gratianus created the heathen Theodosius co-regent, and intrusted him with the administration of the East. Theodosius became a Christian, fought successfully against the Western Goths, but was obliged to accept them as allies in their abodes in Mœsia and Thrace. In 394 the whole empire was reunited for the last time under Theodosius. After his death (395) the empire was divided between his two sons, Honorius and Arcadius, and the eastern and western sections became permanent divisions of the empire, the latter being now under Honorius. For the further history of the Empire of the East, see *Byzantine Empire.*

In 402 Alaric, king of the Visigoths who were settled on the south of the Danube, was incited to invade Italy, but he was soon forced to withdraw on account of the losses he suffered in battle (403). Scarcely had these enemies retreated when great hosts of heathen Teutonic tribes, Vandals, Burgundians, Suevi, and others, made an irruption into Italy on the north; but these also were overcome by Stilicho, the guardian of the youthful emperor Honorius, in the battle of Fæsulæ (or Florence), and compelled to withdraw (406). The Burgundians now settled in part of Gaul, while the Vandals and Suevi crossed the Pyrenees into Spain. In 408 Alaric marched into Italy, advanced to the walls of Rome, and ultimately took the city by storm (410). Shortly after Alaric died, and his brother-in-law Athaulf (Adolphus) concluded a treaty with Honorius, and retired into Gaul, where the Visigoths founded in the southwest a kingdom that extended originally from the Garonne to the Ebro (412). About this time also the Romans practically surrendered Britain, by withdrawing their forces from it and thus leaving it a prey to Teutonic and Scandinavian sea-rovers. In 429 the Vandals wrested the province of Africa from the empire and set up a Vandalic kingdom in its place. In 452 the Huns left their settlements in immense numbers under their king Attila, destroyed Aquileia, took Milan, Pavia, Verona, and Padua by storm, laid waste the fruitful valley of the Po, and were already advancing on Rome when the Roman bishop, Leo I, succeeded in inducing them to conclude a peace with Valentinian, and withdraw. Soon after their leader Attila died (453), and after that the Huns were no longer formidable. Two years after the death of Attila, Eudoxia, the widow of Valentinian, the successor of Honorius, invited the assistance of the Vandals from Africa, who under their leader Genseric proceeded to Rome,

which they took and afterwards plundered for fourteen days, showing so little regard to the works of art it contained as to give to the word vandalism the sense it still expresses (455). They then returned to Africa with their booty and prisoners. After the withdrawal of the Vandals, Avitus, a Gaul, was installed emperor. Under him the Suevian Ricimer, the commander of the foreign mercenaries at Rome, attained such influence as to be able to set up and depose emperors at his pleasure. The last of the so-called Roman emperors was Romulus Augustulus (475–476 A.D.). His election had been secured through the aid of the German troops in the pay of Rome, and these demanded as a reward a third part of the soil of Italy. When this demand was refused, Odoacer, one of the boldest of their leaders, deposed Romulus, to whom he allowed a residence in Lower Italy with a pension, and assumed to himself the title of King of Italy, thus putting an end to the Western Roman Empire, A.D. 476. (See *Italy.*)

Language.— The language of the Romans was the Latin, a language originally spoken in the plain lying south of the Tiber. Like the other ancient Italian dialects (Oscan, Umbrian, etc.) it is a branch of the Indo-European or Aryan family of languages, and is more closely allied to the Greek than to any other member of the family. At first spoken in only a small part of Italy, it spread with the spread of Roman power, till at the advent of Christ it was used throughout the whole empire. The Latin language is one of the highly-inflected languages, in this resembling Greek or Sanskrit; but as compared with the former it is a far inferior vehicle of expression, being less flexible, less adapted for forming compound words, and altogether less artistic in character. The earliest stage of Latin is known almost wholly from inscriptions. During the period of its literary development many changes took place in the vocabulary, inflection, word formation and syntax. In particular, considerable additions to the vocabulary were made from the Greek. At the same time the language gained in refinement and regularity, while it preserved all its peculiar force and majesty. The most perfect stage of Latin is that represented by Cicero, Horace, and Virgil in the first century B.C.; and the classical period of the Latin language ends in the second century A.D. The decline may be said to date from the time of Hadrian (117–138). In the third century the deterioration of the language proceeded at a very rapid rate. In the fourth and fifth centuries the popular speech, no longer restrained by the influence of a more cultivated language, began to experience that series of transmutations and changes which formed the transition to the Romance languages. Latin, however, still remained, through the influence of the church and the law, the literary language till far on in the middle ages; but it was a Latin largely intermixed with Celtic, Teutonic, and other elements, and is now usually called Late or Low Latin. The study of Latin is of great assistance in acquiring an accurate knowledge of English, as a great part of the English vocabulary is of Latin origin, being either taken from the French or from classical Latin directly.

Literature.— The history of Roman literature naturally divides itself into three periods of Growth, Prime, and Decline. The first period extends from about 250 B.C. to about 80 B.C. The second period ranges from 80 B.C. to the death of Augustus in 14 A.D., and includes the greater part of the Roman literature usually studied in schools and colleges. The period of decline then followed. Poetry in this language, as in all others, preceded prose. The oldest forms of Latin poetry were the *Feseennine verses*, which were poems of a jocular and satirical nature sung at marriages and country festivals; satires or improvised dialogues of miscellaneous contents and various form; and the *Atellanæ, fabulæ*, a species of grotesque comedy supposed to resemble the modern Punchinello. The first known writer was Livius Andronicus, a Greek freedman taken prisoner at Tarentum (272 B.C.) and afterwards emancipated, who about 240 B.C. exhibited at Rome a drama translated from the Greek, and subsequently brought out a translation of the *Odyssey.* He was followed by Nævius, who wrote an historical poem on the first Punic war, besides dramas; by the two tragic writers Pacuvius and Accius or Attius; and by Ennius, author of eighteen books of metrical annals of Rome and of numerous tragedies, and regarded by the Romans themselves as the founder of Roman poetry. Mere fragments of these early works alone remain. The founder of Roman comedy was Plautus (254–184 B.C.), who was surpassed for force of comic humor by none of his successors. Next followed Cæcilius; and then Terence (195–159 B.C.), a successful imitator and often mere translator of the Greek dramatist Menander and others, and, although an African by birth, remarkable for the purity and excellence of his Latinity. These three comic writers took the New

Comedy of the Greeks as their model (*Comœdia palliata*) ; and we still possess a number of plays by Plautus and Terence. On the other hand, Afranius, with a few others, introduced Roman manners upon the stage (*Comœdia togata*) Lucilius (148–130 B.C.) was the originator of the Roman poetical satire, the only kind of literary composition among the Romans which was of native origin. Lucretius (B.C. 98–55), a writer full of strength and originality, has left us a philosophical poem inculcating the system of Epicurus, in six books, entitled *De Rerum Natura*. Catullus (94–54 B.C.) was distinguished in lyric poetry, in elegy, and in epigrams. With the age of Augustus a new spirit appeared in Roman literature. The first of the Augustan poets is Virgil (B.C. 70–19), the greatest of the epic poets of Rome, author of eclogues or pastoral poems; the *Georgics*, a didactic poem on agriculture, the most finished of his works; besides the famous epic poem entitled the *Æneid*. Contemporary with him was Horace (B.C. 65–8), the favorite of the lyric muse, and also eminent in satire. In the Augustan age Propertius and Tibullus are the principal elegiac poets. Along with these flourished Ovid (B.C. 43–18 A.D.), a prolific and sometimes exquisite, but too often slovenly poet. During the age of Augustus the writing of tragedies appears to have been a fashionable amusement, but the Romans attained no eminence in this branch.

After the death of Augustus the department of poetry in which greatest excellence was reached was satire, and the most distinguished satirists were Persius, and after him Juvenal (flourished about 100 A.D.), both of whom expressed, with unrestrained severity, their indignation at the corruption of the age. In Lucan (A.D. 38–65), who wrote the *Pharsalia*, a historical epic on the civil war between Cæsar and Pompey; and Statius (flourished about 85 A.D.), who wrote the *Thebaid*, we find a poetic coldness which vainly endeavors to kindle itself by the fire of rhetoric. In the epigrams of Martial (about 43–104 A.D.) the whole social life of the times is mirrored with attractive clearness. Valerius Flaccus (about 70–80 A.D.), who described the Argonautic expedition in verse, endeavored to shine by his learning rather than by his originality and freshness of coloring. Silius Italicus (25–100 A.D.), who selected the second Punic war as the subject of a heroic poem, is merely a historian employing verse instead of prose. To this age belong the ten tragedies under the name of L. Annæus Seneca, the rhetorician. Here also we may mention the *Satyricon* of Petronius, a contemporary of Nero; for although this work, a kind of comic romance in which the author depicts with wit and vivacity the corruption and bad taste of the age, is written mainly in prose, it is interspersed with numerous pieces of poetry, and cannot be classed with any other prose work belonging to Roman literature. After a long period of poetic lifelessness Claudian (flourished about 400) wrote poems inspired with no little of the spirit and grace of the earlier literature.

In the Roman prose literature, eloquence, history, philosophy, and jurisprudence are the principal departments. Prose composition really began with Cato the Censor (234 B.C.), whose work on agriculture, *De Re Rustica*, is still extant. Among the great Roman prose writers the first place belongs to Cicero (106–43 B.C.), whose orations, philosophical and other treatises, letters, etc., are very numerous. Varro's *Antiquities;* Cæsar's *Commentaries;* the *Lives of Illustrious Generals*, of Cornelius Nepos, probably an abridgment of a larger work; and the works of Sallust, are among the more important historical productions down to the Augustan period. Livy the historian (B.C. 59–11 A.D.), author of a voluminous *History of Rome*, is by far the chief representative of Augustan prose. Under Tiberius we have the inferior historian Velleius Paterculus, the anecdotist Valerius Maximus, and Cornelius Celsus, who has left a valuable treatise on medicine. The most important figure of the period of Nero was Seneca the philosopher, put to death by that tyrant in 65 A.D. His chief works are twelve books of philosophical 'dialogues,' two books on clemency addressed to Nero, seven on investigations of nature, and twenty-two books of moral letters. Quintus Curtius compiled a history of *Alexander the Great*, and a contemporary writer, Columella (about 50 A.D.), a treatise on agriculture. The leading prose writers of the next period were Pliny the elder, whose *Natural History* is still extant (23–79 A.D.), a lengthy history and minor treatises being lost; Quintilian (35–118 A.D.), who wrote the *Institutes of Oratory;* and Sextus Julius Frontinus, who has left us treatises on aqueducts and on military devices. In the reigns of Nerva, Trajan, and Hadrian we have two great prose writers — Cornelius Tacitus (about 54–119 A.D.), and Pliny the younger (61–115 A.D.). The former produced a *Dialogue on Orators*, a life of his father-in-law Agricola. a work on Germany, and two works on

Roman history — the *Histories* and the *Annals*. The latter, giving the history of the period between the death of Augustus and the death of Nero, is one of the greatest works of the kind in any literature, but unfortunately only a part of it is in existence. Pliny the younger has left ten books of *Epistles*, and a panegyric in honor of Trajan. C. Suetonius, secretary to Trajan, has left lives of the twelve Cæsars; Cornelius Fonto. the tutor to Marcus Aurelius, a collection of letters, discovered only early in the nineteenth century; and with the *Attic Nights* of Aulus Gellius (second century) — a literary, grammatical, and antiquarian miscellany — the classic Roman prose writers come to a close.

Religion of Ancient Rome.— The ancient religion of the Romans was quite distinct from that of Greece. Though Greek and Etruscan elements were early imported into it, it was, in fact, a common inheritance of the Italians. Towards the end of the republic the theology of Greece was imported into the literature, and to some extent into the state religion. Later on all forms were tolerated. The Roman religion was a polytheism less numerical in deities and with less of the human element in them than that of Greece. The chief deities were Jupiter, the father of gods and men; his wife Juno, the goddess of maternity; Minerva, the goddess of intellect; Mars and Bellona, god and goddess of war; Vesta, the patron of the state, the goddess of the national hearth where the sacred fire was kept burning; Saturnus and Ceres, the god and goddess of agriculture; Ops, the goddess of the harvest and of wealth; Hercules, god of gain, who also presided over contracts; Mercury, the god of traffic; and Neptunus, god of the sea. Venus was originally a goddess of agriculture, but was early identified with the Greek goddess of love, Aphrodite. There were also a host of lesser deities presiding over private and public affairs; domestic gods, the Lares and Penates, etc. The worship consisted of ceremonies, offerings, prayers, sacrifices, games, etc., to secure the favor, avert the anger, or ascertain the intentions of the gods. In private life the ceremonies were performed in the family; in matters concerning the whole community, by the state. The highest religious power in the state was the *College of Pontifices*, which had control of the calendar, and decided upon the action made necessary by the auguries. The chief of this institution was the *pontifex maximus*. The members of the *College of Augurs* consulted the will of the gods as revealed in omens. The *College of Fetiales* conducted treaties, acted as heralds, and generally superintended the relations between Rome and other countries. The officiating priests included the Flamines, who presided in the various temples; the Salii, or dancing priests of Mars; the Vestal Virgins, who had charge of the sacred fire of Vesta; the Luperci, sacred to Pan, the god of the country; the Fratres Arvales. who had charge of boundaries, the division of lands, etc. In addition to their other duties the priests had charge of conducting the various public games, etc.

Rome, the capital of the Roman Kingdom, republic, and empire, and recently of Italy, and long the religious center of western Christendom, is one of the most ancient and interesting cities of the world. It stands on both sides of the Tiber, about 15 miles from the sea, the river here having a general direction from north to south, but making two nearly equal bends, the upper of which incloses a large alluvial flat, little raised above the level of the stream, and well known by the ancient name of Campus Martius. A large part of the modern city stands on this flat, but the ancient city lay mostly to the east and southeast of this, occupying a series of eminences of small elevation known as the seven hills of Rome (the Capitoline, the Palatine, the Aventine, the Quirinal, the Viminal, the Esquiline, and the Cælian hills), while a small portion stood on the other side of the river, embracing an eighth hill (Janiculum). The city is tolerably healthy during most of the year, but in late summer and early autumn malaria prevails to some extent. It has been greatly improved in cleanliness and healthfulness since it became the capital of modern Italy.

Ancient Rome. Topography, etc.— The streets of ancient Rome were crooked and narrow, the city having been rebuilt. after its destruction by the Gauls in 390 B.C., with great haste and without regard to regularity. The dwelling-houses were often very high, those of the poorer classes being in flats, as in modern continental towns. It was greatly improved by Augustus, who extended the limits of the city and embellished it with works of splendor. The Campus Martius during his reign was gradually covered with public buildings, temples, porticos, theaters, etc. The general character of the city, however, remained much the same till after the fire that took place in Nero's reign, when the new streets were made both wide and straight. In the reign of Augustus the population is be-

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ROME: THE ETERNAL CITY

Looking from St. Peter's, the chief shrine of Roman Catholicism, and the largest church edifice in the world.

lieved to have amounted to about 1,300,000, and in that of Trajan was not far short of 2,000,000. Rome is said to have been surrounded by walls at three different times. The first of these was ascribed to Romulus, and inclosed only the original city on the Palatine. The second wall, attributed to Servius Tullius, was 7 miles in circuit, and embraced all the hills that gave to Rome the name of the City of Seven Hills. The third wall is known as that of Aurelian, because it was begun and in great part finished by the emperor of that name. It is mostly the same with the wall that still bounds the city on the left or east bank of the Tiber; but on the right or west bank, the wall of Aurelian embraced only the summit of the Janiculum and a district between it and the river, whereas the more modern wall on that side (that of Urban VIII), embraces also the Vatican Hill. The wall of Aurelian was about 11 miles in length, that of modern Rome is 14 miles. Ancient Rome had eight or nine bridges across the Tiber, of which several still stand. The open spaces in ancient Rome, of which there were a great number, were distinguished into *campi*, areas covered with grass; *fora*, which were paved; and *areæ*, a term applied to open spaces generally, and hence to all those which were neither *campi* nor *fora*, such as the squares in front of palaces and temples. Of the *campi* the most celebrated was the Campus Martius, already mentioned, and after it the Campus Esquilinus, on the east of the city. Among the *fora* the Forum Romanum, which lay northwest and southeast, between the Capitoline and Palatine Hills; and the Forum of Trajan, between the Capitoline and Quirinal, are the most worthy of mention. The first was the most famous and the second the most splendid of them all. The great central street of the city was the Via Sacra (Sacred Way), which began in the space between the Esquiline and Cælian hills, proceeded thence first southwest, then west, then northwest, skirting the northeast slope of the Palatine, and passing along the north side of the Forum, and terminated at the base of the Capitoline. The two principal roads leading out of Rome were the Via Flaminia (Flaminian Way) or great north road, and the Via Appia (Appian Way) or great south road.

Ancient Buildings.— Ancient Rome was adorned with a vast number of splendid buildings, including temples, palaces, public halls, theaters, amphitheaters, baths, porticos, monuments, etc., of many of which we can now form only a very imperfect idea. The oldest and most sacred temple was that of Jupiter Capitolinus, on the Capitoline Hill. The Pantheon, a temple of various gods (now church of S. Maria Rotonda), is still in excellent preservation. It is a great circular building with a dome-roof of stone 140 feet wide and 140 feet high, a marvel of construction, being 2 feet wider than the great dome of St. Peter's. The interior is lighted by a single aperture in the center of the dome. (See *Pantheon.*) Other temples were the Temple of Apollo, which Augustus built of white marble, on the Palatine, containing a splendid library, which served as a place of resort to the poets; the Temple of Minerva, which Pompey built in the Campus Martius, and which Augustus covered with bronze; the Temple of Peace, once the richest and most beautiful temple in Rome built by Vespasian, in the Via Sacra, which contained the treasures of the temple of Jerusalem, a splendid library, and other curiosities, but was burned under the reign of Commodus; the temple of the Sun, which Aurelian erected to the east of the Quirinal; and the magnificent temple of Venus, which Cæsar caused to be built to her as the origin of his family. The principal palace of ancient Rome was the *Palatium*, or imperial palace, on the Palatine Hill, a private dwelling-house enlarged and adopted as the imperial residence by Augustus. Succeeding emperors extended and beautified it. Nero built an immense palace which was burned in the great fire. He began to replace it by another of similar extent, which was not completed till the reign of Domitian. Among the theaters, those of Pompey, Cornelius Balbus, and Marcellus were the most celebrated. That of Pompey, in the Campus Martius, was capable of containing 40,000 persons. Of the Theater of Marcellus, completed B.C. 13 a portion still remains. The most magnificent of the amphitheaters was that of Titus, completed A.D. 80, now known as the Coliseum or Colosseum (which see). Although only one-third of the gigantic structure remains, the ruins are still stupendous. The principal of the circuses was the *Circus Maximus*, between the Palatine and Aventine, which was capable of containing 260,000 spectators. With slight exception its walls have entirely disappeared, but its form is still distinctly traceable. (See *Circus.*) The porticos or colonnades, which were public places used for recreation or for the transaction of business, were numerous in the ancient city, as were also the basilicas or public halls

(See *Basilica.*) Among them may be noted the splendid Basilica Julia, commenced by Cæsar and completed by Augustus; and the Basilica Porcia, which was built by Cato the censor. The public baths or *thermæ* in Rome were also very numerous. The largest were the Thermæ of Titus, part of the substructure of which may still be seen on the Esquiline Hill; the Thermæ of Caracalla, even larger, extensive remains of which still exist in the southeast of the city; and the Thermæ of Diocletian, the largest and most magnificent of all, part of which is converted into a church. Of the triumphal arches the most celebrated are those of Titus (A.D. 81), Severus (A.D. 203), and Constantine (A.D. 311), all in or near the Forum and all well-preserved structures; that of Drusus (B. C. 8), in the Appian Way, much mutilated; that of Gallienus (A.D. 262) on the Esquiline Hill, in a degraded style of architecture. Among the columns the most beautiful was Trajan's Pillar in the Forum of Trajan, 117 feet in height, still standing. The bas-reliefs with which it is enriched, extending in spiral fashion from base to summit, represent the exploits of Trajan, and contain about 2500 half and whole human figures. A flight of stairs within the pillar leads to the top. The most celebrated of the ancient sewers is the *Cloāca Maxima*, ascribed to Tarquinius Priscus, a most substantial structure, the outlet of which is still to be seen. The Roman aqueducts were formed by erecting one or several rows of arches superimposed on each other across a valley, and making the structure support a waterway or canal, and by piercing through hills which interrupted the watercourse. Some of them brought water from a distance of upwards of 60 miles. Among others, the *Acqua Paola*, the *Acqua Trajana*, and the *Acqua Marzia*, still remain, and contribute to the supply of the city, and also its numerous important ornamental fountains. Among the magnificent sepulchral monuments, the chief were the mausoleum of Augustus in the Campus Martius; and that of Hadrian, on the west bank of the Tiber, now the fortress of modern Rome, and known as the Castle of St. Angelo. The city was also rich in splendid private buildings, and in the treasures of art, with which not only the public places and streets, but likewise the residences and gardens of the principal citizens, were ornamented, and of which comparatively few vestiges have survived the ravages of time. The catacombs of Rome are subterranean galleries which were used as burial-places and meeting-places, chiefly by the early Christians, and which extend under the city itself as well as the neighboring country. The chief are the catacombs of Calixtus; of St. Prætextatus on the Via Appia; of St. Priscilla, 2 miles beyond the Porta Salora; of St. Agnese, outside the Porta Pia; of St. Sebastiano, beneath the church of that name; etc. (See *Catacombs.*)

Modern Rome, General Features.— It was not till the seventeenth century that the modern city was extended to its present limits on the right bank, by a wall built under the pontificates of Urban VIII (1623–44) and Innocent X (1644–55), and inclosing both the Janiculum and the Vatican hills. The boundary wall on the left or east bank of the river follows the same line as that traced by Aurelian in the third century, and must in many parts be identical with the original structure. The walls on both banks are built of brick, with occasional portions of stone work, and on the outside are about 55 feet high. The greater part dates from A.D. 271 to 276. The city is entered by twelve gates (several of those of earlier date being now walled up) and several railway accesses. Since Rome became the capital of united Italy great changes have taken place in the appearance of the city, many miles of new streets being built, and much done in the way of paving, drainage, and other improvements. It has thus lost much of its ancient picturesque appearance, and is rapidly acquiring the look of a great modern city, with wide, straight streets of uniform-looking tenements having little distinctive character. It is still, however, replete with ever-varying and pleasing prospects. The extensive excavations recently carried out have laid at last completely bare the remains of many of the grandest monuments of ancient Rome, notably the whole of Forum Romanum and the Via Sacra, the remains of the Temples of Saturn and of Castor and Pollux, the Temples of Vespasian, of Antoninus and Faustina, the Temple of Vesta, etc. A great number of villas and palaces and countless works of art have been brought to light. The villa-gardens, which have been for ages a distinctive feature of Rome, are rapidly disappearing, and are being covered with tenement houses, and new suburbs are springing up on every side. There are seven bridges across the Tiber within the city. Several of these have been erected since the occupation of Rome by the Italian government, and others are in construction. A vast scheme of river embankment has been

carried out to prevent the lower-lying parts of the city from being flooded as in former times.

Streets, Squares, etc.— Among the principal streets and squares of modern Rome are the Piazza del Popolo, immediately within the Porta del Popolo on the north side of the city near the Tiber, with a fine Egyptian obelisk in its center, and two handsome churches in front, standing so far apart from each other and from the adjoining buildings as to leave room for the divergence of three principal streets, the Via di Ripetta, the Corso and the Via del Babuino. The Corso, recently widened and extended, stretches for upwards of a mile in a direct line to its termination at the Piazza di Venezia, not far from the Capitol, and is the finest street in the city. The appearance of the Capitol has been entirely altered to permit the erection of a monument to Victor Emmanuel. The Via del Babuino proceeds first directly to the Piazza di Spagna, thence to the Quirinal, and by a tunnel opens out on the Esquiline. It contains a large number of handsome edifices. The whole of the city to the east of this street, and in the triangular space included between it and the Corso, is well aired and healthy, and is regarded as the aristocratic quarter. The Ghetto, or Jews' quarter, which occupied several mean streets parallel to the river and connected by narrow lanes, was cleared away by the municipal improvements in 1889. The city is supplied with good water partly by the above-mentioned aqueducts, which, constructed under the greatest difficulties five-and-twenty centuries ago, still serve the purpose for which they were built, and remain monuments of engineering skill. The chief open spaces besides the Piazza del Popolo are the Piazza S. Pietro, with its extensive colonnade; the Piazza Navona, adorned with two churches and three fountains, one at each extremity and the third in the center; the Piazza di Spagna, adorned by a monumental pillar and a magnificent staircase of travertine, leading to the church of Trinità de' Monti, conspicuously seated on an eminence above it; the Piazza Berberini, beside the palace of the same name, adorned by a beautiful fountain; the Piazza Colonna, in the center of the city, with column of Marcus Aurelius; near it, in the Piazza di Monte Citoria, is the spacious Chamber of Deputies. Larger spaces for amusement or exercise have been formed in only a few spots. One of the finest is the Pincio, or 'hill of gardens,' overlooking the Piazza del Popolo, and commanding a fine view. It is a fashionable drive towards evening, and presents a gay and animated appearance. At a short distance outside the walls on the north of the city is the Villa Borghese, forming a finely-planted and richly-decorated park of 3 miles in circuit, which, though private property, forms the true public park of Rome, and is the favorite resort of all classes. Various localities in and near Rome that were malarious have been rendered healthy by planting eucalyptus trees.

Churches, etc.— The most remarkable of these is, of course, the cathedral of St. Peter, the largest and most imposing to be found anywhere, for the history and description of which see *Peter's (St.)*. Another remarkable church is that of San Giovanni in Laterano, on an isolated spot near the south wall of the city. It was built by Constantine the Great, destroyed by an earthquake in 896, re-erected (904–911), burned in 1308, restored and decorated by Giotto. Again burned in 1360, it was rebuilt by Urban IV and Gregory XI, and has undergone various alterations and additions from 1430 till the present façade was erected in 1734. A modern extension has involved the destruction of the ancient apse. From the central balcony the pope pronounces his benediction on Ascension Day; and the church is the scene of the councils which bear its name. The residence of the popes adjoined this church until the migration to Avignon; it is now occupied by the Gregorian Museum of the Lateran. Santa Maria Maggiore, which ranks third among the basilicas, was founded by Pope Liberius (352–366), but has since had many alterations and additions, the more notable being those of the fifteenth and sixteenth centuries. Its interior, adorned with thirty-six Ionic pillars of white marble supporting the nave, and enriched with mosaics, is well preserved, and one of the finest of its class. Santa Croce in Gerusalemme, the fourth of the Roman basilicas, takes its name from its supposed possession of a portion of the true cross, and a quantity of earth which was brought from Jerusalem and mixed with its foundation. Other churches are those of San Clemente, on the Esquiline, a very ancient church, said to have been founded on the house of Clement, St. Paul's fellow-laborer, by Constantine, and containing a number of interesting frescoes by Masaccio. It consists of a lower and an upper church and from an archæological point of view is one of the most interesting in Rome. Il Gesù,

on the Corso, the principal church of the Jesuits, with a façade and cupola by Giacomo della Porta (1577), and an interior enriched with the rarest marbles and several fine paintings, decorated in the most gorgeous style, and containing the monument of Cardinal Bellarmine; Sta. Maria-degli-Angeli, originally a part of Diocletian's Baths, converted into a church by Michael Angelo, one of the most imposing which Rome possesses, and containing an altar-piece by Muziano, a fine fresco by Domenichino, and the tomb of Salvator Rosa; Sta. Maria in Ara Cœli, on the Capitoline, a very ancient church approached by a very long flight of stairs, remarkable for its architecture and for containing the figure of the infant Christ called the *santissimo bambino* (see *Bambino*); Sta. Maria in Cosmedin, at the northern base of the Aventine, remarkable for its fine Alexandrine pavement and its lofty and beautiful campanile of the eighth century; Sta. Maria sopra Minerva, so called from occupying the site of a temple of that goddess, begun in 1285 and restored 1848–55, remarkable as the only Gothic church in Rome; Sta. Maria in Dominica or della Navicella, on the Cælian, is remarkable for eighteen fine columns of granite and two of porphyry, and the frieze of the nave painted in *camaieu* by Giulio Romano and Perino del Vaga. Among other notable churches are Sta. Maria della Pace, celebrated for its paintings, particularly the four Sibyls, considered among the most perfect works of Raphael; Sta. Maria del Popolo, interesting from the number of its fine sculptures and paintings (Jonah by Raphael, ceiling frescoes by Pinturicchio, and mosaics from Raphael's cartoons by Aloisio della Pace); Sta. Maria in Trastevere, a very ancient church, first mentioned in 449, re-erected by Innocent III in 1140, and recently restored; San Paolo fuori le Mura, erected to mark the place of St. Paul's martyrdom, founded in 388, and restored and embellished by many of the popes, burned in 1823, and since rebuilt with much splendor. It is of great size, and has double aisles and transepts borne by columns of granite. Above the columns of the nave, aisles, and transepts there is a continuous frieze enriched by circular pictures in mosaic, being portraits of the popes from St. Peter onwards, each 5 feet in diameter. Between the windows in the upper part of the nave are large modern pictures representing scenes from the life of St. Paul.

Palaces, Picture-galleries, etc.— The Vatican, adjoining St. Peter's, comprises the old and new palaces of the popes (the latter now the ordinary papal residence), the Sistine chapel, the Loggie and Stanze, containing some of the most important works of Raphael, the picture-gallery, the museums (Pio-Clementino, Chiaramonti, Etruscan and Egyptian), and the library (220,000 vols. and over 25,000 MSS.). (See *Vatican.*) The palace on the Quirinal was formerly a favorite summer residence of the popes, but is now occupied by the King of Italy. (See *Quirinal.*) The Palazzo della Cancelleria is the only palace on the left bank of the river still occupied by the ecclesiastical authorities. The building was designed by Bramante, and is one of the finest in Rome. A series of palaces crowns the summit of the Capitol, and surrounds the Piazza del Campidoglio. It is approached from the northwest by a flight of steps, at the foot of which two Egyptian lions, and at the summit two colossal statues of Castor and Pollux standing beside their horses, are conspicuous. In the center of the piazza is a bronze equestrian statue of Marcus Aurelius (161–181). On the southeast side of the piazza is the Senatorial Palace, in which the senate holds its meetings. The building also contains the offices of the municipal administration and an observatory. Its façade was constructed by Giacomo della Porta, under the direction, it is said, of Michael Angelo. On the southwest side of the piazza is the palace of the Conservatori, containing a collection of antique sculpture, including objects of art discovered during the recent excavations and a gallery of pictures. Opposite is the museum of the Capitol, with interesting objects of ancient sculpture and a picture-gallery. Among private palaces may be noted the Palazzo Barberini, on the Quirinal, with a collection of paintings. The library attached to it has numerous valuable MSS., with some other literary curiosities. The Palazzo Borghese, begun in 1590, has a fine court surrounded by lofty arcades, but is chiefly celebrated for its picture-gallery, containing the Aldobrandi Marriage and some other works of great renown. The Palazzo Colonna has a picture-gallery and a beautiful garden containing several remains of antiquity. The Palazzo Corsini has a picture-gallery and garden, and a collection of MSS., and printed books of great value. The Palazzo Farnese, one of the finest in Rome, was built under the direction of Antonio da Sangallo, Michael Angelo, and Giacomo della Porta in succession. The celebrated antiquities it once contained (Farnese Bull,

Hercules, Flora, etc.), are now in the Museum of Naples. The Palazzo Rospigliosi, erected in 1603, contains some valuable art treasures; among others, on the ceiling of a casino in the garden is the celebrated fresco of Aurora by Guido. Villa Ludovisi, situated in the north of the city, the ancient gardens of Sallust, contains a valuable collection of ancient sculptures. Villa Farnesina, on the right bank, contains Raphael's charming creations illustrative of the myth of Cupid and Pysche.

Educational Institutions, Charities, etc. — Among educational institutions the first place is claimed by the university, founded in 1303. The most flourishing period of the university was the time of Leo X (1513–22), under whom the building still occupied by it was begun. Attached to the university are an anatomical and a chemical theater, and cabinets of physics, mineralogy, and zoology, as also botanic gardens and an astronomical observatory. The university is attended by about 1000 students. The Collegio Romano, formerly a Jesuit college, now contains the Archæological Museum and the recently established library, Biblioteca Vittorio Emanuele — consisting mostly of the old library of the Jesuits, augmented by the libraries of suppressed monasteries (about 500,000 vols.). The Collegio de Propaganda Fide has acquired great celebrity as the establishment where Roman Catholic missionaries are trained. (See *Propaganda.*) The Accademia di San Luca, for the promotion of the fine arts, is composed of painters, sculptors, and architects, and was founded in 1595, and reorganized in 1874. Connected with it are a picture-gallery and schools of the fine arts. Other associations and institutions connected with art, science, or learning are numerous; one of them, the Accademia de' Lincei, founded in 1603 by Galileo and his contemporaries, is the earliest scientific society of Italy. Besides the Vatican and Vittorio Emanuele libraries mentioned above, the chief are the Biblioteca Casanatense, 200,000 vols.; the Biblioteca Angelica, 150.000 vols.; the Biblioteca Barberini, 100,000 vols. and over 10,000 MSS., etc. For elementary education much has been done since the papal rule came to an end. Hospitals and other charitable foundations are numerous. The principal hospital, called Spirito Santo, a richly-endowed institution situated on the right bank of the Tiber, combines a foundling hospital (with accommodation for 3000), a lunatic asylum (accommodation for 500), an ordinary infirmary (accommodation for 1000), and a refuge for girls and aged and infirm persons. The chief theaters are the Teatro Apollo, Teatro Argentina, Teatro Valle, the Capranica, Metastasio, Rossini, Costanzi, etc.

Trade and Manufactures.— The external trade is unimportant, and is carried on chiefly by rail, the Tiber being navigated only by small craft. There are railway lines connecting with the general system of Italy; and steamers from Civita Vecchia to Naples, Leghorn, and Genoa. A ship canal is projected to connect the city with the sea, and extensive embankment works are in progress to prevent inundation by the Tiber. The chief manufactures are woolen and silk goods, artificial flowers, earthenware, jewelry, musical strings, mosaics, and objects of art. The trade is chiefly in these articles, and in olive-oil, pictures, and antiquities.

History.— The ancient history of Rome has already been given in the preceding article. From the downfall of the empire its history is mainly identified with that of the papacy. (See *Popes, Papal States, Italy.*) An important event in its history was its capture and sack by the troops of the Constable of Bourbon in 1527. In 1798 Rome was occupied by the French, who stripped the palaces, churches, and convents of many works of art and objects of value. Pope Pius VI was taken prisoner to France, where he soon afterwards died, and a Roman republic was set up. In 1848 Pope Pius IX was driven from Rome, and another Roman republic formed under Mazzini and Garibaldi. A French army was sent to the pope's assistance, and after a determined resistance Rome was captured by the French in July, 1849, and the pope returned and resumed his power under the protection of French bayonets (April, 1850). The rule of the pope continued till Oct. 1870, when Rome was occupied by the Italian troops on the downfall of the French empire, and in June, 1871, the 'Eternal City' became the capital of united Italy. The king took up his residence in the Quirinal; and to accommodate the legislature and various public departments numerous conventual establishments were expropriated. The population of the city has of late vastly increased. In 1870 it was 226,022; in 1911, 542,123.

Rome, a city, county seat of Floyd Co., Georgia, at the junction of the Oostanaula, Etowah and Coosa rivers, 72 miles N. of Atlanta. It is a large cotton-shipping center and has iron foundries, brick yards, cotton and oil mills, etc. Pop. (1920) 13,252.

Rome, a city and one of the county seats of Oneida Co., New York, on the Mohawk River and the State Barge Canal, 15 miles N. W. of Utica. It is the seat of several state and other institutions, and has manufactures of iron, brass and copper products, radiators, automobiles, bedsteads, locomotives, electrical supplies, etc. Pop. (1910) 20,497; (1920) 26,341.

Rome, AMERICAN ACADEMY IN, an American institution for the higher study of the arts in Rome, Italy. It is the outgrowth of the American School of Architecture in Rome, founded by Charles F. McKim and Daniel Burnham, American architects. In 1897 the scope was enlarged by the founding of the American Academy in Rome, for students of architecture, painting and sculpture. The Prix de Rome, which carries with it a $1000 income for each of three years, free residence in the academy and opportunity for travel, is awarded annually in architecture, painting, sculpture, music and classical studies. The American headquarters is at 101 Park Avenue, New York.

Rome, FRENCH ACADEMY AT, founded by Louis XIV in 1666. The Grand Prix de Rome, open to Frenchmen only, is given by the French government to artists, sculptors, etc.

Romford (rom'furd), an ancient market-town in Essex, England, is situated on the Rom, about 12 miles E. N. E. of London. It is celebrated for its ale, and is surrounded by market-gardens. Pop. (1921) 19,448.

Romilly (rom'il-li), SIR SAMUEL, an English lawyer (1757-1818), noted for his work in the reform of the criminal law.

Rommany. See *Gypsies.*

Romney (rom'ni), GEORGE, an English painter, born near Dalton, in Lancashire, in 1734; died at Kendal in 1802. He was the son of a carpenter, and at first worked at his father's trade, but he afterwards was apprenticed to an itinerant artist named Steele, and at the age of twenty-three began the career of a painter. After a certain amount of local success he went to London in 1762, and next year won a prize offered by the Society of Art for a historical composition. He steadily rose in popularity, and was finally recognized as inferior only to Reynolds and Gainsborough as a portrait-painter; some critics even placed him higher than either. Many distinguished Englishmen and many ladies of rank sat to him for their portraits; but perhaps the most beautiful of his sitters was Emma Hart, afterwards Lady Hamilton, whom he depicted in very numerous characters. He did not neglect historical or imaginative compositions, and he contributed several pictures to Boydell's famous Shakespere gallery, founded in 1786. Romney displays a want of carefulness, and defective knowledge of anatomy in his historical compositions; but he atones for these faults by fine color, a subtle sense of beauty, and by his originality. Fine examples of his work command high prices.

Romney, NEW, a small but ancient town of England in Kent, one of the Cinque Ports, formerly on the coast, but now some distance inland. Pop. 1333.

Romorantin (ro-mo-răn-tan), a town of France, in the department of Loir-et-Cher, 23 miles S. E. of Blois, has manufactures of woolen goods and parchment. Pop. 6836.

Romsey (rom'si), a municipal borough of England, Hampshire, on the Test or Anton, 8 miles N. W. of Southampton, with a fine old Norman church. Pop. 4671.

Romulus (rom'ū-lus), the mythical founder and first king of Rome. The legend tells us that his mother was the Vestal virgin, Sylvia or Ilia, a daughter of Numitor, king of Alba. By the god Mars she became the mother of the twins Romulus and Remus, who were ordered by Amulius, the usurping brother of Numitor, to be thrown into the Anio. The basket containing the two boys was stranded beneath a fig-tree at the foot of the Palatine Hill, and they were suckled by a she-wolf and fed by a woodpecker, until they were accidentally found by Faustulus, the king's herdsman, who took them home and educated them. When they had grown up they organized a band of enterprising comrades, by whose help they deposed Amulius and reinstated Numitor on his throne. They next resolved to found a city, but as they disagreed as to the best site for it, they resolved to consult the omens. The decision was in favor of Romulus, who immediately began to raise the walls. This is said to have happened in the year 753 (according to others 752 or 751) B.C. Remus, who resented his defeat, leaped over the rude rampart in scorn, whereupon Romulus slew him. Romulus soon attracted a considerable number of men to his new city by making it a place of refuge for every outlaw or broken man, but women were still wanting. He, therefore, invited the

Sabines with their wives and daughters to a religious festival, and in the midst of the festivities he and his followers suddenly attacked the unarmed guests, and carried off the women to the new city. This led to a war, which was, however, ended at the entreaties of the Sabine wives, and the two states coalesced. Romulus is said finally to have miraculously disappeared in a thunderstorm (B.C. 716).

Rom'ulus Augus'tulus, the last of the Roman emperors of the West. See *Rome.*

Ronaldshay (ron'ald-shā), NORTH and SOUTH, respectively the most northerly and the most southerly of the Orkney Islands. They have small populations, engaged chiefly in the cod and herring fishery.

Roncesvalles (ron-thes-vål'yes), a valley in Spanish Navarre, between Pampeluna and St. Jean de Port, where the rear of Charlemagne's army was defeated by the Gascons or Basques in 778, the paladin Roland being killed. Tradition and romance erroneously ascribe the victory to the Moors.

Ronciglione (ron-chēl-yō'nā), a small Italian town in the province of Rome, 35 miles N.W. from the capital; contains a Roman triumphal arch and a ruined castle. Pop. 6658.

Ronda (rōn'da), a town of Southern Spain, in Malaga province, 40 miles west of Malaga, romantically situated on a sort of rocky promontory surrounded on three sides by the Guadalvin, which flows through the 'Tajo,' a deep chasm separating the old Moorish town, with its narrow tortuous lanes and Moorish towers, from the modern quarter. Over this ravine there are an old and a modern bridge, the latter about 600 feet above the water. Ronda is famous for its bull-fights, for which it has one of the largest bull-rings in Spain. It has manufactures of steel wares, cloth, etc., and is celebrated for its fruits. Pop. 20,905.

Rondeletia (ron-de-let'i-a), a genus of shrubs, nat. order Rubiaceæ, characterized by having a calyx with a subglobular tube. They occur chiefly in tropical America and the West Indies. A kind of fever bark is obtained at Sierra Leone from *Rondeletia febrifuga.* A perfume sold as rondeletia takes its name from this plant, but is not prepared from any part of it.

Rondo (ron'do; Italian), or RONDEAU (ron-dō; French), a poem of thirteen lines, usually octosyllabic, written throughout on two rhymes and arranged in three unequal stanzas; while the two or three first words are repeated as a refrain after the eighth and thirteenth lines. The term is also applied to a musical composition, vocal or instrumental, generally consisting of three strains, the first of which closes in the original key, while each of the others is so constructed in point of modulation as to reconduct the ear in an easy and natural manner to the first strain.

Rönne (rėn'ne), chief town of the Danish Island of Bornholm, is a seaport with several ship-building yards, a mercantile fleet and considerable trade. Pop. 9292.

Ronneburg (rōn'ne-burg), a town of Germany, in Saxe-Altenburg, 14 miles southwest of Altenburg, contains an old château, and has some manufactures. Pop. 6187.

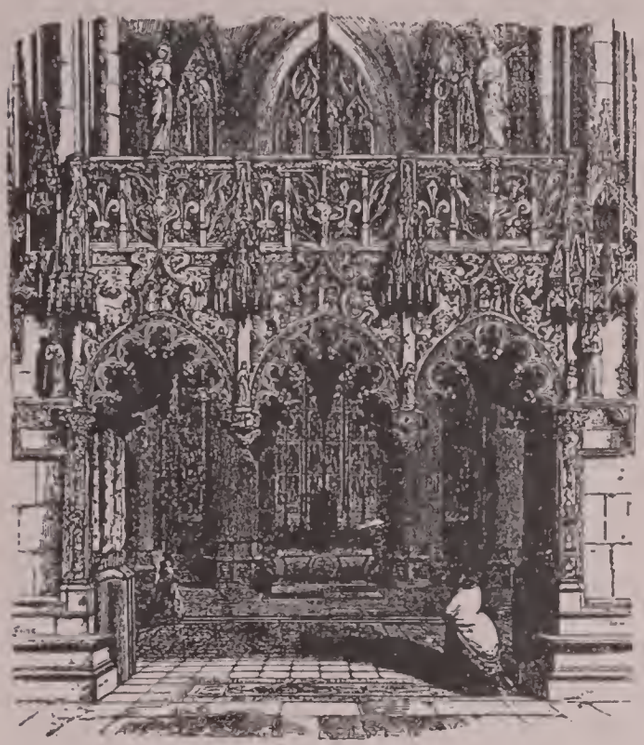
Ronsard (roṇ-sär), PIERRE DE, a French poet, born in 1524; died in 1585. At the age of twelve he became page to the Duc d'Orleans; and in 1537 he accompanied James V of Scotland and his bride, Madeleine of France, back to their kingdom. He also spent six months at the English court, and after his return to France in 1540 was employed in a diplomatic capacity in Germany, Piedmont, Flanders and Scotland. He was compelled, however, by deafness to abandon the diplomatic career; and he devoted himself to literary studies, and became the chief of the band of seven poets afterwards known as the 'Pléiade.' Ronsard's popularity and prosperity during his life were very great. Henry II, Francis II, and Charles IX esteemed him, and the last bestowed several abbacies and priories on the poet. His writings, consisting of sonnets, odes, hymns, eclogues, elegies, satires and a fragment of an epic poem, *La Franciade,* were read with enthusiastic admiration. Ronsard combines magnificent language and imagery with a delicate sense of harmony.

Röntgen (reunt'gen), WILLIAM KONRAD, physicist, born at Lennep, Prussia, in 1845. He studied at Zürich, where he took his doctor's degree in 1869, and was professor of physics at Strasburg, Giessen, and after 1885 at Würzburg. In 1895 he became widely known by his signal discovery of the Röntgen rays, or X-Rays (which see).

Röntgen Rays. See *X-Rays.*

Rood (röd), a measure of surface, the fourth part of an acre, equal to 40 square poles or perches, or to 1210 square yards.

Rood, an old English name for a cross, especially applied to a large crucifix or image of Christ on the cross, placed at the entrance to the chancel in



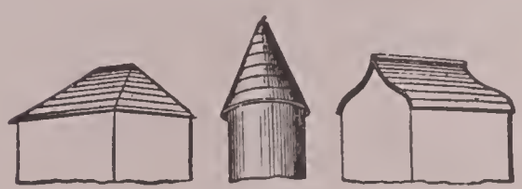
Rood-screen, Madelaine, Troyes.

the old churches, generally resting on the rood-beam or rood-screen, often in a narrow gallery called the *rood-loft*.

Roof (röf), the cover of any building, irrespective of the materials of which it is composed. Roofs are distinguished, 1st, by the materials of which

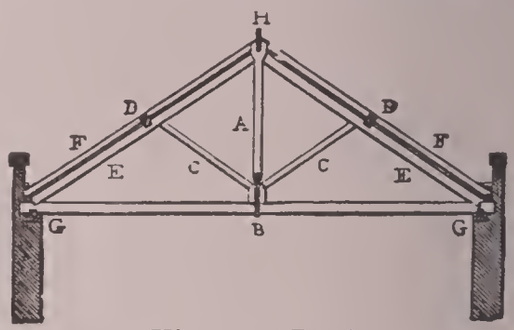
Curb Roof. M-Roof.

Shed Roof. Gable Roof.



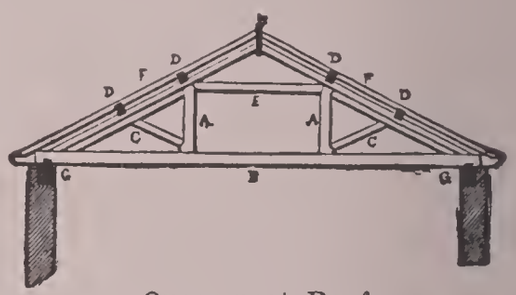
Hip Roof. Conical Roof. Ogee Roof.

they are mainly formed, as stone, wood, slate, tile, thatch, iron, etc.; 2d, by their form and mode of construction, as shed, curb, hip, gable, pavilion, ogee and flat roofs. The *span* of a roof is the width between the supports; the *rise* is the height in the center above the level of the supports; the *pitch* is the slope or angle at which it is inclined. In carpentry roof signifies the timber framework by which the roofing materials of the building are supported. This consists in



King-post Roof.

A, King-post. B, Tie-beam.
C C, Struts or braces. D D, Purlins.
E E, Backs or principal rafters. F F, Common rafters.
G G, Wall-plates. H, Ridge-piece.



Queen-post Roof.

A A, Queen-posts. B, Tie-beam.
C C, Struts or braces. D D, Purlins.
E, Straining-beam. F F, Common rafters.
G G, Wall-plates. H, Ridge-piece.

general of the principal rafters, the purlins and the common rafters. The principal rafters, or principals, are set across the building at about 10 or 12 feet apart; the purlins .lie horizontally upon these, and sustain the common rafters, which carry the covering of the roof. Sometimes, when the width of the building is not great, common rafters are used alone to support the roof.

Rook (ruk), a bird of the crow family (*Corvus frugilegus*), differing from the crow in not feeding upon carrion, but on insects and grain. It is also specially distinguished by its gregarious habits, and by the fact that the base of the bill is naked, as well as the forehead and upper part of the throat. In Britain and Central Europe the rook is a permanent resident; but in the north and south it is migratory in habit.

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THEODORE ROOSEVELT (1858-1919)

Twenty-sixth President of the United States. No name better became him than that given him by Kipling: "Our world has diminished with GREATHEART away." William Howard Taft, in his Introduction to Dr. William Draper Lewis' "Life of Theodore Roosevelt" says: "The nation has lost the most commanding, the most original, the most interesting, and the most brilliant personality in American public life since Lincoln."

Rooke (rük), Sir George, an English admiral, was born near Canterbury in 1650; died 1709. He entered the navy at an early age and rose to be vice-admiral in 1692. For his gallantry in a night attack upon the French fleet off Cape La Hogue he was knighted in 1692. His further services include the command of the expedition against Cadiz in 1702, the destruction of the French and Spanish fleets in Vigo Bay (1702), and a share in the capture of Gibraltar in July, 1704. In the following August he fought a French fleet of much superior force, under the Comte de Toulouse, off Malaga. The result was undecisive, and this fact was used against Rooke by his political opponents. Sir George quitted the service in disgust in 1705. He served in several parliaments as member for Portsmouth.

Roosevelt (rōs'e-velt), Theodore, twenty-sixth President of the United States, was born in New York City of a prominent family of Dutch descent, October 27, 1858; died January 6, 1919, at Oyster Bay, New York. He graduated at Harvard University in 1880; engaged for a time in legal study, and was a Republican member of the New York Legislature 1882-84, winning distinction as a leader in reform. He subsequently spent some time in scouting and hunting life in te West, was candidate for mayor of New York in 1886, and was an active member of the United States Civil Service Commission 1889-95. He was appointed President of the New York Police Board in 1895 and in this duty showed an energy in enforcing the laws that gave him a national reputation. In 1897 he was appointed Assistant Secretary of the Navy, adding to his reputation by his foresight in preparing the navy for the threatened war with Spain. On the outbreak of the war he at once resigned, recruited a regiment (the First Volunteer Cavalry), popularly known as the 'Rough Riders,' and showed marked daring and skill in leading them in the brief campaign in Cuba. Returning as the popular hero of the war, he was nominated and elected Governor of New York in 1898, and filled this office with an energetic spirit of reform that greatly enhanced his reputation. Among his notable acts as governor were the investigation of the state canal system with regard to which there had been much talk of fraud during the previous administration, the checking of predatory corporations through taxation of franchises and the extension of the civil service system to include many state offices previously under political control. He desired a second term as governor in order to complete the reforms inaugurated, but in the Republican National Convention of 1900 he received the nomination for Vice-President of the United States, and was elected, with President McKinley.

The assassination of President McKinley on Sept. 14, 1901, raised Vice-President Roosevelt to the presidency. His animated and picturesque career, and the position of an earnest and energetic reformer which he had filled, had made him a popular favorite, and much interest was felt as to how he would act in this elevated position. His unshakable stand against the illegal acts of the great corporations, the purchase and active development of the Panama canal, the ringing tone of reform in his messages to Congress, and his open defiance of political domination, added greatly to his standing in public esteem, and in 1904 he was nominated for President and elected by much the highest popular majority which any President ever received. During his four years' term he succeeded in having a number of bills passed which gave the government a considerable degree of control over the corporations and carried through successfully various measures of reform. The semiforeign requirements of the Panama canal and the government of the Philippine Islands were managed with ability and success, and such international questions as the Venezuela dispute and the calling of a second Hague conference added to his prestige in Europe. This was redoubled by his useful service in bringing about a treaty of peace between Russia and Japan, and at the close of his term on March 4, 1909, President Roosevelt was looked upon as one of the ablest and most forcible among the rulers of the world. His several movements in the interest of peace were acknowledged by the award to him in 1906 of the $40,000 Nobel Peace prize. With this he endowed a Foundation for the Promotion of Industrial Peace.

Declining a second nomination for the presidency, he set out at the end of his term on a hunting excursion to eastern Africa. He had previously shown a marked love for hunting and other outdoor pursuits, and his year's hunting adventures in Africa were notably successful and supplied the Smithsonian Institution with a fairly complete collection of the wild game of that continent. Mrs. Roosevelt joined him at Khartoum and there began a sort of triumphal journey through the capitals of Europe unequaled since Grant's. He was greeted everywhere as the representative American and received by the rulers of the various countries with royal honors. He made a number of and delivered notable lectures at the Sorbonne,

Paris, and at Berlin, Oxford and Christiania Universities, all of which conferred degrees upon him. During his stay in England the death of King Edward VII occurred and Mr. Roosevelt was appointed the special ambassador of the United States at the funeral. On June 18, 1910, he landed at New York to receive the greatest welcome ever accorded an American citizen returning to his native land. Among the many thousands who marched in the great parade of welcome was his old regiment, the Rough Riders. During his absence a split had occurred in the Republican party occasioned by the Ballinger-Pinchot controversy and resulting in a division of the party into Conservatives, supporting Taft, and Progressives, opposing him. Both parties tried to secure Roosevelt's support as the recognized leader of the Republican party. After an unsuccessful effort to carry New York for the Republicans, he withdrew for a time from public activity, devoting himself to editorial work on the *Outlook*. His support of Pinchot (Taft supporting Ballinger) led to a gradual widening of the split in the party. In 1910 he made a tour in which he expounded the theory of the New Nationalism, a program of reform, and in 1912 he added to the program in his famous Charter of Democracy speech before the Ohio Constitutional Convention. In 1912 he emerged as Republican candidate for president. He vigorously denounced the methods of the Republican National Convention, from which his supporters withdrew and organized a Progressive party, nominating him as its candidate. While making a round of campaign speeches he was shot by a lunatic at Milwaukee on October 14, and narrowly escaped a fatal wound. He was defeated in the November election, receiving 88 electoral and 4,168,564 popular votes. He subsequently made a journey of exploration in South America, where he made a number of addresses before universities and learned societies, and explored the River of Doubt [which was later named the Rio Téodoro (q. v.) in his honor], the discovery of which he announced on his return to New York in 1914. He was nominated by the Progressive Party for president in 1916, but declined the nomination and supported the Republican candidate. Taking up editorial work again he became an extensive contributor to magazines and newspapers. From the outbreak of the World war (see *European War*) he was an ardent champion of American preparedness and of the cause of the Allies against the Central Powers, and after the sinking of the *Lusitania* strongly urged the declaration of war by the United States against Germany. On the entry of the United States into the World war, Colonel Roosevelt offered to raise and lead to France a complete division. Denied this opportunity, he devoted his great powers to the arousing of American patriotism, the sale of Liberty Bonds and to counteracting the spread of German propaganda in the United States. Of his four sons, Lieutenant-Colonel Theodore, Jr., Captain Archibald, and Lieutenant Quentin won commissions in the United States Army and Captain Kermit in the British Army. The death of Quentin, who was killed in an ærial battle over the German lines, July 17, 1918, threw a shadow over the last months of Colonel Roosevelt's life and various illnesses led to his removal on several occasions to the Roosevelt Hospital. He returned home on Christmas Day, 1918, from the last of these, and on January 6, 1919, the great American passed away. Almost as one man the nation stood united in a sense of deep regret and personal bereavement. A period of mourning was ordered by President Wilson for the Army and Navy and government departments. The funeral rites were very simple and the body was laid to rest in the little cemetery at Oyster Bay, Long Island, near his home.

Aside from his official life, Roosevelt's career of great activity along diversified lines cannot be overlooked. As a devotee of outdoor sports, hunter, explorer, and wood chopper, as typifying the strenuous life, the wielder of the big stick, advocate of simplified spelling, opponent of race suicide and enemy of nature fakirs, as coiner of phrases and forceful expressions, he impressed his personality to an extraordinary degree on the American people. His literary output was of a high order and included not only scholarly historical works, but entertainingly written accounts of his hunting and exploring trips, essays, political works, etc. He was the author of many notable state papers, some of which will live among the greatest in American archives. As a speaker, his style was forceful, fluent and convincing. As an executive he was resourceful in devising and bold in attempting needed reforms for which others had struggled in vain and tireless in pursuit of his object. He was honored with degrees from nearly every important American university and many foreign ones. He was a member of the American Academy of Arts and Letters, and in 1912 was elected president of the American Historical Association.

Among Roosevelt's published works

are: *History of the Naval War of 1812* (1882); *Hunting Trips of a Ranchman* (1885); *Life of Thomas Hart Benton* (1886); *Life of Gouverneur Morris* (1887); *Ranch Life and Hunting Trail* (1888); *History of New York* (1890); *The Wilderness Hunter* (1893); *The Winning of the West* (1889-96); *American Ideals* (1897); *The Rough Riders* (1899); *Life of Oliver Cromwell* (1900); *The Strenuous Life* (1900); *African Game Trails* (1910); *European and African Addresses* (1910); *The New Nationalism* (1910); *Realizable Ideals* (1912); *Conservation of Womanhood and Childhood* (1912); *History as Literature, and Other Essays* (1913); *Theodore Roosevelt, An Autobiography* (1913); *Through the Brazilian Wilderness* (1914); *Life Histories of American Game Animals* (1914); *America and the World War* (1915); *Fear God and Take Your Own Part* (1916); *Foes of Our Own Household* (1917).

Roosevelt, a borough of Middlesex Co., New Jersey, on Rahway River and Staten Island Sound, 6 miles s. of Elizabeth. It has creosote, steel, and chemical plants, fertilizer factories, oil mills, etc. Pop. (1920) 11,047.

Roosevelt Dam, the most important feature of the Salt River Project (q. v.), an undertaking of the U. S. Reclamation Service for the irrigation of land in the valley of the Salt River, Arizona. The Roosevelt Dam is located in the mountains, 75 miles northeast of Phœnix, Arizona, in a narrow gorge of the Salt River. The dam is built on a curve upstream, is 286 feet high from foundation to parapet, 235 long at the base and 1080 feet long on top.

It contains about 340,000 cubic yards of masonry, and is constructed of broken range cyclopean rubble thoroughly bonded together. The reservoir outlet is through a tunnel about 500 feet long, in which six gates are placed, which are used for sluicing and for regulating the flow from the reservoir. With the reservoir full to capacity, these gates can discharge about 10,000 cubic feet of water per second. Two spillways, each about 200 feet long, carry the flood waters around the dam. The dam backs up the waters of Salt River and Tonto Creek for a distance of about 16 miles, forming a lake 45 miles long and from one to two miles wide, containing about 450,000,000,000 gallons of water, sufficient to irrigate 240,000 acres of land. The cost of the dam was $6,500,000. It was completed on February 5, 1911, and opened on March 18, 1911, by President Theodore Roosevelt, for whom the dam was named.

Root, George Frederick, song writer, born at Sheffield, Massachusetts, in 1820; died in 1895. He wrote numerous popular songs, some of which were *Hazel Dell; Rosalie, the Prairie Flower; Tramp, Tramp, Tramp,* etc.

Root, Elihu, statesman, born at Clinton, New York, Feb. 15, 1845. He graduated in law at the New York University Law School in 1867, became eminent as a lawyer, and was United States district attorney for the southern district of New York 1883–85. He entered President McKinley's cabinet as Secretary of War in 1899, resigning in January, 1904. In July, 1905, he succeeded John Hay as Secretary of State, and in 1909 was elected United States senator from New York.

Rope (rōp), a general name applied to cordage over 1 inch in circumference. Ropes are usually made of hemp, flax, cotton, coir, or other vegetable fiber, or of iron, steel, or other metallic wire. A hempen rope is composed of a certain number of yarns or threads which are first spun or twisted into *strands*, and the finished rope goes under special names according to the number and arrangement of the strands of which it is composed. A *hawser-laid rope* is composed of three strands twisted left-hand, the yarn being laid up right-hand. A *cable-laid rope* consists of three strands of hawser-laid rope twisted right-hand; it is called also *water-laid*, or *right-hand rope*. A *shroud-laid rope* consists of a central strand slightly twisted, and three strands twisted around it, and is thus called also *four-strand rope*. A *flat rope* usually consists of a series of hawser-laid ropes placed side by side and fastened together by sewing in a zigzag direction. Wire ropes are made of a certain number of wires twisted into the requisite number of strands, and are now extensively used in the rigging of ships as well as for cables. For greater flexibility hempen cores are used; thus for instance we may have a rope of six strands around a hempen core, each strand consisting of six wires around a smaller hempen core. Steel wire makes a considerably stronger rope than iron wire. Coir ropes are much used on board ships, as, though not so strong as hemp, they are not injured by the salt water.

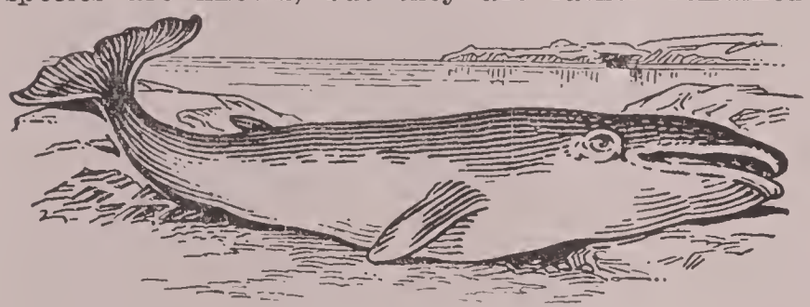
Ropes (ropz), John Codman, historian, born of American parents at St. Petersburg, Russia, April 28, 1836. He studied at Harvard Law School and was admitted to the bar in 1861. He organized the Military Historical Society of Massachusetts, and was active in inducing the United States government to

collect and preserve information about the Civil war. He wrote *The Army under Pope*, *The First Napoleon*, *The Campaign of Waterloo*, *Atlas of Waterloo*, and *Story of the Civil War*. He died Oct. 28, 1899.

Roraima (ro-rå-ē′må), a celebrated mountain in South America, where the boundaries of British Guiana, Venezuela, and Brazil meet, 8740 feet high, flat-topped, with steep rocky sides, rendering the summit almost inaccessible. Sir E. Im Thurn and Mr. Perkins were the first to reach its top in 1884. It is a part of the Pacaraima range.

Roric Figures (rō′rik), the name given to certain curious appearances seen on polished solid surfaces after breathing on them; also to a class of related phenomena produced under very various conditions, but agreeing in being considered as an effect of either light, heat, or electricity.

Rorqual (ror′kwal), the name given to a genus of whales, closely allied to the common or whalebone whales, but distinguished by having a dorsal fin, with the throat and under parts wrinkled with deep longitudinal folds, which are supposed to be susceptible of great dilatation, but the use of which is as yet unknown. Two or three species are known, but they are rather



Rorqual (*Balænoptĕra boöps*)

avoided on account of their ferocity, the shortness and coarseness of their baleen or whalebone, and the small quantity of oil they produce. The northern rorqual (*Balænoptĕra boöps*) attains a great size, being found from 80 to over 100 feet in length, and is thus the largest living animal known. The rorqual feeds on cod, herring, pilchards and other fish, in pursuing which it is not seldom stranded on the shore.

Rosa, Monte (mon′tā rō′så), a mountain or group of the Pennine Alps, lies on the frontiers of the Swiss canton of Valais and Piedmont, and forms part of the watershed between the Rhone and the Po. Next to Mont Blanc it is the highest mountain in the Alps, but as a group it is much more massive than the Mont Blanc group. It has eight summits above 14,000 feet, the highest being Dufourspitze (15,217), ascended for the first time in 1855. Of the huge glaciers that occupy the slopes of this mountain the chief are the Görner Glacier on the west, the Schwarzberg and Findelen Glaciers on the north, the Sesia and Macugnaga Glaciers on the east, and the Lys Glacier on the south.

Rosa, Salvator (sal′vå-tor rō′så), an Italian painter, etcher and poet, born near Naples in 1615; died in 1673. He received instruction in art from his brother-in-law, Francesco Fracanzaro, a pupil of Ribera, but his taste and skill were more influenced by his studies of nature on the Neapolitan coast. Rosa's father, dying in 1632, left his family in difficulties, and Salvator was compelled to sell his landscapes for small sums. One of his pictures fell into the hands of the painter Lanfranco, who at once recognized the genius of the youth, and encouraged him to go to Rome. In 1638 Rosa settled in Rome, where he soon established his reputation and rose to fame and wealth. The bitterness of his satire, expressed both in his satirical poems and in an allegorical painting of the *Wheel of Fortune*, rendered his stay in Rome inadvisable. He therefore accepted an invitation to Florence (1642), where he remained nearly nine years, under the protection of the Medici. He finally returned to Rome, where he died. Salvator Rosa delighted in romantic landscape. His poems were all satires, vigorous enough and pungent; among them are *Babylon* (*i. e.*, *War*, and *Envy*. Rosa etched Rome), *Music Poetry*, *Painting*, with great skill.

Rosacea, (rō-zā′se-ē), Acne Rosacea, or Gutta Rosea, an affection which appears on the face, especially the nose, forehead, cheeks and skin, characterized by an intense reddening of the skin without swelling. Persons who indulge in alcohol to excess are liable to it. Regular habits, and plain and temperate living, both prevent and cure.

Rosa′ceæ, a large and important order of plants, of which the rose is the type, distinguished by having several petals, distinct, perigynous, separate carpels, numerous stamens, alternate leaves, and an exogenous mode of growth. The species, including herbs, shrubs and trees, are for the most part inhabitants of the cooler parts of the world. Scarcely any are annuals. The

apple, pear, plum, cherry, peach, almond, nectarine, apricot, strawberry, raspberry and similar fruits, are produced by species of this order. Some of the species are also important as medicinal plants. The genera of this order are divided by Viner into six tribes, viz., Roseæ, Spiræeæ, Amygdaleæ, Sanguisorbeæ, Dryadeæ and Pomeæ.

Rosamond (rōs'a-mond), commonly called Fair Rosamond, the mistress of Henry II of England, was the daughter of Walter de Clifford, a knight of property in various shires. She died in 1176 or 1177, soon after her connection with the king was openly avowed, and was buried in the church of Godstow Nunnery, whence, however, Hugh of Lincoln caused her body to be removed in 1191. Almost everything else related of Rosamond is legendary. The fable of the dagger and poison with which the jealous Queen Eleanor is said to have sought out her rival has not been traced higher than a ballad of 1611.

Rosaniline (rō-zan'a-lin; $C_{20}H_{19}N_3$), an organic base, a derivative of aniline, crystallizing in white needles, capable of uniting with acids to form salts, which salts form the well-known rosaniline coloring matter of commerce.

Rosario (rō-sä'rē-ō), a town of the Argentine Republic, in the province of Santa Fé, on the right bank of the Paraná, 170 miles northwest of Buenos Ayres. Founded in 1725 as an Indian settlement, it was still a humble village in 1854 when it was made a port of entry, but since then its progress has been marvelous, and it is now the second city in the republic. It has communication by rail and river with Buenos Ayres, and also by railway with the interior provinces. The town is laid out on the rectangular plan, and is provided with gas, tramways, etc. It contains foundries, brick-works, jam factories, breweries, tanneries, soap works, timber and flour mills, etc., but its commerce is of greater importance than its manufactures, large quantities of wool, hides, and grain being exported. Pop. (1914) 224,838.

Rosary (rō'za-ri), among Roman Catholics the recitation of the Ave Maria and the Lord's Prayer a certain number of times. The name is also commonly given to the string of beads by means of which the prayers are counted. The complete or Dominican rosary consists of 150 small beads for the Aves, divided into groups of 10 by 15 large beads for the Paternosters. The ordinary rosary has only 50 small beads and 5 large beads; but if repeated thrice makes up the full rosary. A doxology is said after every tenth Ave. The use of rosaries was probably introduced by the Crusaders from the East, for both Mohammedans and Buddhists make use of strings of beads while repeating their prayers; but St. Dominic is usually regarded as the institutor in the Roman Church.

Roscelli'nus, or ROSCELIN (ros-laṇ), JOANNES, a heretical theologian of the twelfth century, was a native of Northern France. A nominalist in philosophy, he was a tritheist in theology, but was forced to recant by the synod of Soissons in 1092, while Anselm refuted him in his *De Fide Trinitatis*. After an attempt to make capital out of Anselm's quarrel with William Rufus, Roscelin settled at Tours, where he entered into a violent theological controversy with Abelard, who had been his pupil. His subsequent history is not known.

Roscius (rō'she-us), QUINTUS, the most celebrated comic actor at Rome, born a slave about 134 B.C. He realized an enormous fortune by his acting, and was raised to the equestrian rank by Sulla. He enjoyed the friendship of Cicero, who in his early years received instruction from the great actor. Roscius died about 62 B.C.

Roscoe (ros'kō), SIR HENRY ENFIELD, a distinguished chemist, born in London, January 7, 1833, a grandson of William Roscoe. Educated at Liverpool High School, University College, London and Heidelberg, Roscoe on his return to England devoted himself to science, especially chemistry, in which he did useful and brilliant work. From 1858 till 1886 he was professor of chemistry at Owens College, Manchester, and from 1885 to 1895 represented South Manchester in parliament in the Liberal interest. Honors of all kinds have flowed in upon him from the universities, and learned societies, and in Nov., 1884, he was knighted. His works include *Investigations on the Chemical Action of Light; Lessons in Elementary Chemistry; Lectures on Spectrum Analysis;* and, with Professor Schorlemmer, a *Treatise upon Chemistry* (3 vols., 1877–84).

Roscoe, THOMAS, fifth son of William Roscoe, born near Liverpool in 1791; died at London in 1871; author, translator, and editor. In 1823 he published translations of Sismondi's *Literature of Southern Europe,* and *Memoirs of Benvenuto Cellini;* in 1828 a translation of Lanzi's *History of Painting in Italy;* in 1839, *Life and Writings of Cer-*

vantes. He edited the *Novelist's Library* (16 vols. 12mo, 1831–33), and translated a series of foreign novels, besides writing several books of travels.

Roscoe, WILLIAM, historian and miscellaneous writer, was born in New Liverpool, March 8, 1753; died June, 1831. After a not very extensive education he was, in 1769, apprenticed to an attorney in Liverpool; and in 1774 he entered into partnership with Mr. Aspinall. He felt strongly on the question of the abolition of slavery and published a poem (*The Wrongs of Africa*) and several controversial pamphlets on the subject. In 1796 his great work, *Life of Lorenzo de Medici*, was published, and at once gained him a high reputation, which was perhaps neither lessened nor enhanced by his *Life and Pontificate of Leo X* (1805). In 1796 Roscoe retired from the business of an attorney, and he eventually became a partner in a Liverpool banking house in 1800. For about a year, in 1806–07, he represented Liverpool, his native town, in parliament. In 1816 the bank fell into difficulties, which resulted in bankruptcy in 1820. Roscoe spent his last years in literary and scientific pursuits.

Roscommon (ros-kom'un), an inland county of Ireland, in the east of the province of Connaught, has an area of 950 sq. miles. The surface is undulating or flat, except in the north. The Shannon bounds most of the county on the east, and the Suck on the northwest. The chief of the numerous lakes is Lough Ree, an expansion of the Shannon. Roscommon contains iron and coal, but limestone is the only mineral now worked. Many districts are highly fertile, and the pastures are among the best in Ireland. The chief crops are oats and potatoes. The chief towns are Roscommon, Boyle, and Castlerea. Pop. 101,640.— The county-town, ROSCOMMON, 80 miles from Dublin, contains the ruins of an abbey founded in 1257, and of a fine castle of about the same date. It gives the title of earl to the Dillon family. Pop. 1891.

Roscommon, WENTWORTH DILLON, FOURTH EARL OF, an English minor poet, was born in 1633; died in 1685. He was a favorite at the court of Charles II. His chief poems are *Essay on Translated Verse*, a translation of Horace's *Art of Poetry*, and some smaller pieces. He has been called the only moral writer of the reign of Charles II.

Roscrea (ros'krā), a market town of Ireland, in the county of Tipperary, 95 miles S. W. of Dublin, contains the ruins of two castles and an abbey, and a well-preserved round tower 80 feet high. Pop. about 2500.

Rose (rōs), the beautiful and fragrant flower which has given name to the large natural order Rosaceæ, seems to be confined to the cooler parts of the northern hemisphere. The species are numerous, and are extremely difficult to distinguish. They are prickly shrubs, with pinnate leaves, provided with stipules at their base; the flowers are very large and showy; the calyx contracts towards the top, where it divides into five lanceolate segments; the corolla has five petals, and the stamens are numerous; the seeds are numerous, covered with a sort of down, and are attached to the interior of the tube of the calyx, which, after flowering, takes the form of a fleshy, globular or ovoid berry. The rose is easily cultivated, and its varieties are almost endless. In the natural state the flowers are single, but double varieties, such as the damask rose (*R. damascēna*), Provence rose (*R. centifolia*), and musk-rose (*R. moschāta*) were introduced into Britain 300 years ago. Upwards of 1000 named varieties of rose are now recorded. The North American species of roses, and especially those of the United States, are few, those grown in our gardens being mostly of foreign origin.

Rose, a disease. See *Erysipelas.*

Rose Acacia (*Robinia hispida*, nat. order Leguminosæ), a highly ornamental flowering shrub inhabiting the southern parts of the Allegheny Mountains, and now frequently seen in gardens in Europe. It is a species of locust; the flowers are large, rose-colored, and inodorous; the pods are glandular-hispid. See *Locust.*

Rose-apple, or MALABAR PLUM, a tree of the genus *Eugenia*, the *E. Jambos*, belonging to the nat. order Myrtaceæ. It is a branching tree, a native of the East Indies. The fruit is about the size of a hen's egg, is rose-scented and has the flavor of an apricot.

Rose-bay, the name of several plants; as, (*a*) the *Nerium Oleander.* See *Oleander.* (*b*) The *dwarf rose-bay*, a plant of the genus *Rhododendron*, having handsome flowers. (c) *Epilobium angustifolium*, or French willow. See *Epilobium.*

Rosebery (rōz'be-ri), ARCHIBALD PHILIP PRIMROSE, EARL OF, born in London, May 7, 1847, was educated at Eton and Oxford, and succeeded his grandfather in 1868. He became an advanced Liberal in politics.

and a ready and effective speaker. He was under-secretary at the home office from 1881 to 1883, lord privy seal and first commissioner of works, 1885, and next year held the secretaryship of foreign affairs till the fall of the Gladstone government. In 1878 he was elected lord-rector of Aberdeen University, and in 1881 of Edinburgh University. In 1889 he became a member of the London County Council, and was appointed chairman of that body. The University of Cambridge conferred the degree of LL.D. on him in 1888. He advocated the reform of the House of Lords, and became much interested in the questions of imperial federation and the social condition of the masses. In 1892 he became foreign secretary, and, when Gladstone retired from public life in 1894, succeeded him as Premier. His term of office ended in 1895, and he resigned the Liberal leadership in 1896.

Rosecrans (rōs'kranz), WILLIAM S., soldier, was born at Kington, Ohio, in Sept., 1819, and was graduated from West Point in 1842. He was employed as engineer until 1854, when he resigned from the army, but in the summer of 1861 was commissioned brigadier-general, being second to McClellan in this campaign; and in July won the battle of Rich Mountain, W. Va., and was made major-general. Next year he gained a decisive victory at Corinth, Mississippi, and in 1863 the battle of Stone River, but was defeated at Chickamauga. In January, 1864, he was made commander of the Missouri District, was Minister to Mexico, 1868; Congressman, 1881-85, and Registrar of the Treasury 1885-93, dying March 11, 1898.

Rosedale (rōz'dāl), a city of Wyandotte Co., Kansas, on the Kansas River, 4 miles s. w. of Kansas City. It has iron and wire works, etc. Pop. (1920) 7674.

Roselle (rō-zel'), a borough of Union Co., New Jersey, 1 mile w. of Elizabeth. Has manufactures of hydraulic machinery. (Pop. (1920) 5737. —ROSELLE PARK, a residential borough of Union Co., New Jersey, adjoining Roselle. Pop. (1920) 5438.

Rosemary (rōz'ma-ri; *Rosmarīnus officinalis*), a shrubby aromatic plant (nat. order Labiatæ), a native of Southern Europe. It has but two stamens; the leaves dark green, with a white under surface; the flowers are pale blue. At one time of considerable repute for medicinal purposes, rosemary is now esteemed chiefly for yielding, by distillation, the aromatic perfume known as oil of rosemary.

Rose of Jericho (*Anastatica hierochuntina*), a small cruciferous plant, growing in the arid wastes of Arabia and Palestine. When full grown and ripe its leaves drop and

Rose of Jericho (*Anastatica hierochuntina*). 1. The plant. 2. The plant in a dry state. 3. The same plant expanded after being put in water.

it becomes rolled up like a ball in the dry season, but opens its branches and seed-vessels when it comes in contact with moisture. The generic name has been applied to it from this circumstance, and in Greek signifies resurrection.

Roseola (rō-zē'u-la), in medicine, a kind of rash or rose-colored efflorescence, mostly symptomatic, and occurring in connection with different febrile complaints. Called also *rose-rash* and *scarlet rash*.

Roses, ATTAR or OTTO OF. See *Attar of Roses*.

Roses, WARS OF THE, the fierce struggle for the crown of England between the Lancastrians (who chose the red rose as their emblem) and the Yorkists (who chose the white); it lasted with short intervals of peace for thirty years (1455–85), beginning with the battle of St. Albans and ending with Bosworth Field. See *England*, section *History*.

Rosetta (rō-zet'ta; Egyptian, *Reshîd*, the ancient *Bolbitine*). a city of Egypt, near the mouth of the Rosetta branch of the Nile, 30 miles w. of Alexandria. Rosetta at one time enjoyed a large transit trade, which, however, has now been almost entirely diverted to Alexandria. The town is well built and attractive in appearance. Pop. about 16,000.

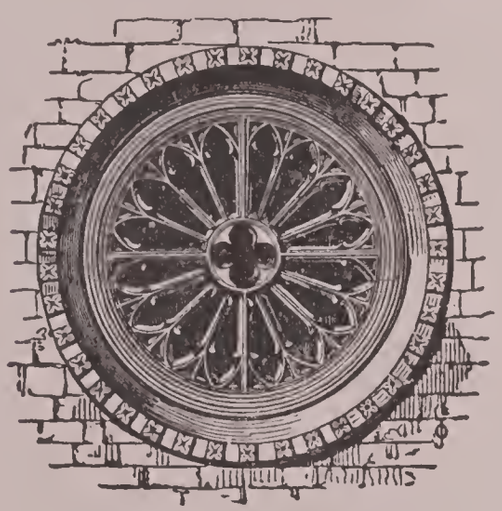
Rosetta-stone, a tablet of black basalt, bearing an inscription in three versions (hieroglyphic, enchorial, and Greek) in honor of Ptolemy Epiphanes and belonging to

about 196 B.C. It is of great importance from the fact that it furnished the key for the deciphering of the hieroglyphic inscriptions. The stone, discovered by the French near Rosetta in 1799, is now in the British Museum. See *Hieroglyphics.*

Rosetta-wood, a handsome furniture wood, of an orange-red color with very dark veins, imported from the East Indies. It is of durable texture, but the colors become dark by exposure.

Rose-water, water tinctured with roses by the process of distillation. The gathering of rose-leaves for this purpose is quite an industry in the United States.

Rose-window, a circular window, divided into compartments by mullions and tracery radiating from a center, also called Catharine-wheel, and marigold-window, according to modifications of the design. It forms a fine feature in the church architecture of the thirteenth and fourteenth cen-



Rose-window, St. David's.

turies, and is mostly employed in the triangular spaces of gables. In France it is much used, and, notwithstanding difficulties of construction, attained great size. Some examples, as that at Rheims Cathedral, are over 40 feet in diameter.

Rosewood, a wood obtained from the *Dalbergia nigra* and other trees belonging to the nat. order Leguminosæ, so named because some kinds of it when freshly cut have a faint smell of roses. Most rosewood comes from Brazil, but it is also found in Honduras and Jamaica. The name is sometimes given to timber from other sources; but the French *Bois de Rose* (the German *Rosenholz*) is called tulip-wood in English.

Rosewood, Oil of, same as oil of rhodium. See *Rhodium.*

Rosicrucians (rōs-i-krö′shi-anz), members of a secret society, the first account of which was published early in the seventeenth century in two books now generally ascribed to J. V. Andreæ, a Lutheran clergyman of Württemberg. Many regard Andreæ's writings as merely a veiled satire on his own times, and deny altogether the actual existence of any such society, in spite of the fact that since his day many persons (*e.g.*, Cagliostro) have professed to belong to it. The aim of the Rosicrucians, or Brothers of the Rosy Cross, was said to be the improvement of humanity by the discovery of the 'true philosophy,' and they claimed a deep knowledge of the mysteries of nature, such as the permutation of metals, the prolongation of life, the existence of spirits, etc. According to Andreæ the society was founded in the fourteenth century by a German baron named Rosenkreuz (*i.e.*, 'rosy cross,') who was deeply versed in the mysterious lore of the East, and who assembled the initiated in a house called the Sancti Spiritus Domus. The 'secret' of the order, if any ever existed, was faithfully guarded by its members; and the general cloud of mystery shrouding its history and objects has led to its being connected in public opinion with the Cabalists, Illuminati, etc. Some regard Rosicrucianism as the origin of Freemasonry.

Rosin (roz′in), the name given to the resin of coniferous trees employed in a solid state for ordinary purposes. It is obtained from turpentine by distillation. In the process the oil of the turpentine comes over and the rosin remains behind. There are several varieties of rosin, varying in color from the palest amber to nearly black, and from translucent to opaque. It differs somewhat according to the turpentine from which it is derived, this being obtained from numerous species of pine and fir. Rosin is a brittle solid, almost flavorless, and having a characteristic odor. It is used in the manufacture of sealing-wax, varnish, cement, soap, for soldering, in plasters, etc. Colophony is a name for the common varieties.

Roskolnicians. See *Raskolniks.*

Roslin (roz′lin), or Rosslyn, a small village in the county of Midlothian, about 7 miles south of Edinburgh, interesting chiefly for its ruined castle and chapel. Roslin Castle is of uncertain origin, but it was the ancient seat of the St. Clairs or Sinclairs, who lived here in great splendor in the fifteenth century. The present buildings were mostly erected since the burning of the

castle by the Earl of Hertford in 1554. Roslin Chapel was founded in 1450 by Sir William St. Clair, and is a Gothic structure forming the chancel and part of a transept of a church, no more of which was ever built. The interior is richly adorned with exquisite carving.

Rosmini-Serbati (ros-mē'nē sėr'-bä-tė), ANTONIO, a modern Italian philosopher, born at Roveredo, Tyrol, in 1797; died in 1855. He entered the priesthood and founded the charitable order of Rosminians, which has branches in Italy, France, Britain, and America. He is regarded as the founder of modern Idealism in Italy. The chief points of his system are fully treated in his *New Essay on the Origin of Ideas*, translated into English, 1883. He was a most voluminous writer on religious and miscellaneous subjects as well as on philosophy.

Rosolic Acid (rō-zol'ik; $C_{20}H_{16}O_3$), an acid prepared by treating hydrochloride of aniline with nitrate of soda and then boiling with sulphuric acid. It is used in preparing a blue dye.

Ross, a town near the Wye, in Herefordshire, England, 11 miles S. E. of Hereford. The philanthropic John Kyrle (died in 1724), Pope's 'Man of Ross,' is buried in the handsome parish church. Pop. (1911) 4682.

Ross, ALEXANDER, a Scottish poet, born in 1699; died in 1784. He was schoolmaster at Lochlee in Forfarshire, and author of *Helenore, the Fortunate Shepherdess*, a pastoral poem in the Scottish dialect, formerly very popular in the north of Scotland.

Ross, ALEXANDER, born in Nairnshire, Scotland, in 1783; died at Red River Settlement (Winnipeg), in 1856. He went to Canada in 1805; joined Astor's expedition to Oregon in 1810, and was afterwards a fur-trader in the Hudson's Bay service. He is the author of *Adventures of the First Settlers on the Oregon, Fur Hunters of the Far West*, and the *Red River Settlement*.

Ross, ALEXANDER MILTON, naturalist, was born at Belleville, Ontario, in 1832; died in 1897. He served in the United States army as a surgeon during the Civil war. He wrote many works on the natural history of Canada, etc., and made large collections of animals and plants.

Ross, SIR JAMES CLARK, Arctic and Antarctic explorer, was born in London in 1800; died in 1862. He entered the British navy at the age of twelve; accompanied his uncle, Sir John Ross (see following article), on his two voyages in search of a northwest passage, and in the interval between them, accompanied Captain William Parry in his three Arctic voyages. He was promoted to the rank of post-captain in 1834, particularly for the discovery of the north magnetic pole in 1831. He commanded the expedition in the *Erebus* and *Terror* to the Antarctic Ocean in 1839–43; and on his return published a narrative of that voyage, which had contributed largely to geographical and scientific knowledge generally. Captain Ross was knighted for his services, and received numerous other honors. In 1848 he made a voyage in the *Enterprise* to Baffin's Bay in search of Sir John Franklin.

Ross, SIR JOHN, Arctic navigator, born in Wigtonshire, Scotland, in 1777; died in 1856. In 1786 he entered the navy, and he saw abundant service before the peace of 1815, which found him with the rank of commander. In 1817 he accepted the command of an admiralty expedition to search for a northwest passage, and in April, 1818, set sail in the *Isabella*, accompanied by Lieut. Parry in the *Alexander*. After passing through Davis' Straits and Baffin's Bay the vessels entered Lancaster Sound, and proceeded up it for a considerable distance, when Ross conceived the erroneous idea that the sound was here brought to a termination by a chain of mountains, and accordingly returned to England. Shortly after landing he was advanced to the rank of post-captain, and the following year published an account of his voyage. His next expedition, in the steamer *Victory*, was equipped by Sir Felix Booth, and set out in May, 1829. Ross entered Prince Regent's Inlet, and discovered and named Boothia Felix and King William's Land. In 1832 he was forced to abandon his ships, and he and his crew suffered great hardships before they were picked up in August, 1833, by his old ship the *Isabella*. In 1834 Captain Ross was knighted, and in the following year published a narrative of his second voyage. From 1839 till 1845 Sir John Ross was consul at Stockholm. In 1850 he made a last Arctic voyage in the *Felix*, in a vain endeavor to ascertain the fate of Sir John Franklin. He became a rear-admiral in 1851.

Ross and Cromarty, two northern counties of Scotland, but generally treated of as one, the latter consisting merely of detached portions scattered over the former. They extend across the breadth of Scotland from the North Sea to the Atlantic, between the counties of Inverness and Sutherland, and include the island of Lewis and other

islands. Area of the whole 3876 square miles. The west coast is bold and rugged, and deeply indented with bays and inlets. A great portion of Ross and Cromarty consists of irregular masses of lofty rugged mountains, some of which are from 3500 to 4000 feet in height. Sheep farming and grazing are extensively carried on. There are several fine lakes, the principal of which is Loch Maree, about 12 miles long by 2 miles broad. Pop. 76,400.

Rossano (ros-sä'nō), an ancient town of Southern Italy, province of Cosenza, 3 miles south of the Gulf of Taranto. In the neighborhood are quarries of alabaster and marble. Pop. 13,-354.

Rossbach (ros'bâh), a village in the Prussian province of Saxony, between Naumburg and Merseburg, famous for the decisive victory which Frederick the Great obtained there, during the Seven Years' war, over the imperial and French troops under Marshal Soubise, November 5, 1757.

Ross-Church, Florence Marryat, novelist, was born at Brighton, England, July 9, 1837, the daughter of Capt. Frederick Marryat (which see). She became editor of *London Society* in 1872. Among her many novels are: *Too Good for Him, Her Lord and Master, How Like a Woman, The Hampstead Mystery,* etc. Also, *There is No Death* and other works dealing with spiritualism. She died Oct. 27, 1899.

Rosse (ros), William Parsons, third Earl of, was born at York in 1800; died in 1867. His chief attention was devoted to the study of practical astronomy, and in 1827 he constructed a reflecting telescope, the speculum of which had a diameter of three feet, and the success and scientific value of this instrument induced him to attempt to cast a speculum twice as large. After many difficulties, he succeeded, in 1845, in perfecting machinery which turned out the huge speculum, weighing 3 tons, without warp or flaw. It was then mounted in his park at Parsonstown, on a telescope 54 feet in length with a tube 7 feet in diameter. The sphere of observation was immensely widened by Lord Rosse's instrument, which was chiefly used in observations of nebulæ.

Rossetti (ros-et'tē), Gabriel Charles Dante, better known as Dante Gabriel, painter and poet, was born in London about 1828; and died in April, 1882. His father, Gabriele Rossetti (1783–1854), a native of Italy and an Italian poet of considerable distinction, was a political refugee in London, where he became professor of Italian in King's College, and was known as an able though eccentric commentator upon Dante. Dante Gabriel early showed a predilection for art, studied in the Royal Academy, then became a pupil of Ford Madox Brown; and in 1848 joined Holman Hunt, Thomas Woolner, Millais, and others in founding the so-called Pre-Raphaelite Brotherhood, to whose organ, the *Germ*, he contributed several poems. In 1849 he exhibited his painting of the *Girlhood of Mary Virgin;* but his later works, numerous as they were, were rarely seen by the public until the posthumous exhibition of a collection of his paintings in 1883, at the Royal Academy. His principal paintings are: *Dante's Dream,* the *Salutation of Beatrice,* the *Dying Beatrice, La Pia, Proserpine, Sibylla Palmifera, Monna Vanna,* and *Venus Verticordia.* His reputation as a painter was surpassed by his fame as a poet, and his poems are characterized by the same vivid imagination, mystic beauty and sensuous coloring as his paintings. In both arts he appears as a devotee of mediævalism. His chief poems are the *House of Life,* a poem in 101 sonnets; the *King's Tragedy and other Ballads, Dante at Verona, Blessed Damozel,* etc. In 1861 he published the *Early Italian Poets,* a series of translations in the original meters, afterwards reissued under the title of *Dante and his Circle.* His wife died in 1862, two years after marriage, and from this grief he never entirely recovered.— His sister, Christina Georgina (born 1830), was a poet of high merit. Her chief works are: *Goblin Market and other Poems* (1862), *The Prince's Progress and other Poems* (1866), *The Pageant and other Poems* (1881), besides prose stories, books for children, and several devotional works. She died in 1894.— His brother, William Michael (born 1829), an assistant-secretary in the Inland Revenue Office, distinguished himself as an art critic and literary editor.

Rossini (ros-sē'nē), Gioachino Antonio, an Italian operatic composer, was born at Pesaro, Feb. 29, 1792; died Nov. 13, 1868. The son of a musician in humble life, he began to learn music very early, and by the kindness of a patron became a pupil in the Lyceum at Bologna. He wrote a great number of both comic and serious operas, the first successful one of which was *Tancredi* (1813), and enjoyed a high degree of reputation and wealth. In 1824 he visited London, and from 1824 till 1836, he resided at Paris, where he

held, till 1830, a high-salaried post in connection with the Théâtre des Italiens. He then spent some years at Bologna and Florence, but in 1855 he returned to Paris, where he died. His body was removed to Florence in 1887. Rossini effected in Italy the improvements in opera carried out by Mozart in Germany. He curtailed the long recitative parts of serious opera, promoted the basso to a leading part, made the orchestration livelier, and no longer left the ornamentation of his songs to the discretion of the singers. He is specially considered to be a master of melody. His finest opera is *William Tell* (1829). Other chief works are: *Othello* (1816), *Moses in Egypt* (1818), and *Semiramide* (1823); and the comic operas, the *Barber of Seville* (1816), and *La Cenerentola* (1817). He also composed a *Stabat Mater* (1842), a *Missa Solennis* (first performed in 1869), and various cantatas, oratorios, and pianoforte pieces.

Rostand (ros-tand'), Edmond, dramatist, was born at Marseilles, France, in 1868, educated in Paris, his first play, *The Romanticists*, being produced in 1894. It was a marked success and was followed by *Princess Loiutaine*, *The Samaritan*, *Cyrano de Bergerac*, and *L'Aiglon*. These have been widely played, Coquelin and Sarah Bernhardt presenting them in Europe and America. His *Chantecler* (1910), in which all the characters are birds and animals, is remarkable for originality and poetic brilliance. In 1915 he published a chant to the Stars and Stripes (*Le Chant des Astres*), foretelling victory. He died Dec. 2, 1918.

Roster (ros'tẽr), a military term signifying a list or register, showing or fixing the rotation in which individuals, companies, regiments, etc., are liable to serve.

Rostock (ros'tok), the largest town in Mecklenburg-Schwerin, Germany, is situated on the navigable Warnow, 7 miles S. of the Baltic Sea and 60 miles E. N. E. of Lübeck. A few relics of the picturesque mediæval town have survived the great fire of 1677. The chief buildings are the church of St. Mary (fourteenth century), remarkable for the height of its roof; the town-house, with seven towers; the palace, and the university (founded 1419); Rostock, with the fore-port of Warnemünde, carries on a fairly active but declining, export trade (chiefly with England) in grain; and imports coals, timber, oil and iron. It was the birthplace of Blücher, a statue of whom adorns one of the squares. Pop. (1919) 67,953.

Rostof. See *Rostov*.

Rostopchin (ros-top'chēn), Feodor Vasilievitch, Count, born in 1765, of an ancient Russian family, was governor of Moscow at the time of the French invasion of 1812. Napoleon accused him in his despatches of having deliberately set fire to Moscow, but he himself decidedly denied this charge in his *Vérité sur l'Incendie de Moscou* (Paris, 1823). It is at least certain that if Rostopchin did not cause the catastrophe, he fully expected it when he evacuated the city. In 1814 he was present at the Congress of Vienna. He died at Moscow in 1826, leaving behind him a number of historical memoirs, comedies, etc., in Russian and French.—His daughter-in-law, Evdokia Petrovna Rostopchin (1812–58), is distinguished in Russian literature as a poetess and novelist.

Rostov, or Rostof (rŏs-tŏf'), a town in Russia, in the government of Jaroslav, and 35 miles S. S. W. of the town of Jaroslav, on Lake Nero. It is one of the oldest towns in Russia, being mentioned in the ninth century, has a cathedral and a very important annual fair. Pop. 13,106.

Rostov', or Rostof, a town of Southern Russia, in the government of Ekaterinoslav, on the Don, about 20 miles above its mouth in the Sea of Azof. Its importance is due to the agricultural development of S. Russia, which has raised it in about a century from a mere village to a large town with important fairs, and extensive grain-shipping industry, and trade in wool, oil, tallow, ores, pitch, etc. Pop. (1910) 172,225.

Rostra. Rostrum, a platform or stage in the forum in Rome; so called from the beaks (*rostra*) of the ships taken, in 338 B. C., from the Antiates, with which it was adorned.

Roswell (roz'wel), a city, county seat of Chaves Co., New Mexico, on the Pecos River, 170 miles N. E. of El Paso, Texas. It has farming and livestock interests. Home of New Mexico Military Institute. Pop. (1920) 7033.

Rot, a disease incident to sheep (sometimes to other animals), and caused by the presence in the gall-bladder and biliary ducts of the common liver-fluke (*Distŏma hepaticum*), developed from the germs swallowed by the sheep with their food. The average length of the mature fluke is about 1 inch. The disease is promoted by a humid state of soil or atmosphere.

Rotary (rō'ta-ri) CLUB, any one of the numerous clubs in the association of business and professional men known as the International Association of Rotary Clubs. The first Rotary was founded in 1905 by Paul P. Harris, an attorney of Chicago. There are now clubs all over the world. Not more than one representative of each line of business or profession is admitted to a Rotary Club, and not more than one Club can be organized in any one city except New York. The keyword of Rotary is 'Service,' and its slogan, 'He profits most who serves best.'

Rota (rō'ta), an ecclesiastical court composed of prelates or auditors subject only to the authority of the Pope, which gives opinions on public cases.

Rotation (rō-tā'shun), in physics, is the motion of a body about an axis, so that every point in the body describes a circular orbit, the center of which lies in the axis. It is thus distinguished from revolution, or the progressive motion of a body revolving round another body or external point. If a point, which is not the center of gravity, be taken in a solid body, all the axes which pass through that point will have different moments of inertia, and there must exist one in which the moment is a maximum, and another in which it is a minimum. Those are called the *principal axes of rotation.* When a solid body revolves round an axis its different particles move with a velocity proportional to their respective distances from the axis, and the velocity of the particle whose distance from the axis is unity is the *angular velocity of rotation.*

Rotation of Crops, in agriculture and horticulture, is the system or practice of growing a recurring series of different annual crops upon the same piece of land. The system is based on the fact that different crops absorb different quantities of the various inorganic constituents of the soil, thus impoverishing it for crops of the same kind, but leaving it unimpaired, or even improved, for crops feeding upon other constituents. Different soils and climates require different schemes of rotation, but it is a tolerably universal rule that culmiferous or seed crops should alternate with pulse, roots, herbage, or fallow. Where land is to be subjected to a crop of the same plants for a number of years, as in permanent pasture, the plants composing the crop should be of several different kinds, seeking a different kind of aliment; hence the propriety of sowing clover or ribwort among pasture-grasses.

Rotatoria. See *Rotifera.*

Rotche, SEA-DOVE, or LITTLE AUK (*Mergŭlus melanoleucus*), an aquatic bird belonging to the family of auks or Alcidæ, about the size of a large pigeon. It frequents the Arctic seas, and comes to land only during the breeding season. Its plumage is black on the back and wings, white on the breast.

Roth (rōt), RUDOLF VON, a German Sanskritist, born in 1821; from 1856 professor of oriental languages at Stuttgart, as well as university librarian. His chief work is a great Sanskrit dictionary in collaboration with Böhtlingk (which see). He died in 1895.

Rothe (rō'tė), RICHARD, a German Protestant theologian, born in 1799. From 1823 till 1828 he was chaplain to the Prussian embassy at Rome. He afterwards held various professorial posts at Wittenberg (1828–37), Heidelberg (1837–49), and Bonn (1849–54), and finally returned to Heidelberg, where he died in 1867. The work upon which his fame principally rests is his *Theologische Ethik*, a complete system of speculative theology, published in 1845–48, occupying a middle position between the rationalistic and orthodox schools of theology. According to Rothe the rational man is developed by the processes of animal evolution, but spirit is a superphysical development.

Rothenburg - ob - der - Tauber (rō'ten-bur*h*; 'above the Tauber'), a town of Bavaria, in Middle Franconia, on a height above the Tauber, 29 miles S. S. E. of Würzburg. Its position is naturally strong, being on a promontory, and having a deep valley on two of its sides. The walls, towers of defense, and gateways are still complete as in the days of bows and arrows. The mass of the town may be said to date from 1560, but two churches and some private dwellings are of much earlier date. Altogether it is one of the most perfectly preserved examples of a small mediæval town. Pop. 8621.

Rotherham (roth'ėr-am), a borough of England, in the West Riding of Yorkshire, 5 miles northeast of Sheffield, on the Don at its junction with the Rother. The fine Perpendicular church dates from the time of Edward IV; the grammar school from 1483. Rotherham has an Independent college, and extensive iron-works and manufac-

tures of soap, starch, glass and ropes. Pop. (1911) 62,507.

Rothermel (roth'er-mel), PETER FREDERICK, painter, was born in Luzerne Co., Pennsylvania, in 1817; died August 15, 1895. He made visits for study to Europe, but resided chiefly in Philadelphia. His subjects were largely from events in American history, and he won much distinction as a historical painter. Among his prominent paintings are *De Soto Discovering the Mississippi*, *Patrick Henry before the Virginia House of Burgesses*, *Battle of Gettysburg*, etc. Many of his pictures have been engraved.

Rothesay (rōth'sā), a royal borough, seaport, and favorite watering-place of Scotland, chief town of the county of Bute, is beautifully situated at the head of a fine bay on the northeast of the island of Bute. Rothesay has little trade, though nominally the center of a fishing district. Its prosperity in great measure depends upon its popularity as a health resort, and on the many visitors it receives during summer. Its climate is very mild in winter, and it is on that account often selected as a residence by pulmonary sufferers. Nearly in the center of the town stands the ruined royal castle, supposed to have been originally built in 1098 by Magnus Barefoot of Norway. It was burned in 1685. Rothesay gives the title of duke to the Prince of Wales. Pop. 9378.

Rothschild (rōt'shilt; in English generally pronounced roths'chīld or ros'chīld), the name of a family of Jewish bankers, distinguished for their wealth and influence. The founder of the original banking-house was Mayer Anselm Bauer (1743–1812), a poor orphan, born in Frankfort-am-Main. Though educated as a teacher, Bauer entered a bank in Hanover, and finally saved sufficient capital to found a business of his own in the famous Judengasse of Frankfort, at the sign of the Red Scutcheon (Roth Schild), which afterwards gave name to the family. He gained the friendship of the Landgrave of Hesse, who appointed him his agent, and in 1802 he undertook his first government loan, raising ten million thalers for Denmark. At his death in 1812 he left five sons, the eldest of whom, Anselm Mayer von Rothschild (1773–1885), became head of the firm in Frankfort, while the others established branches at various foreign capitals: Solomon Mayer (1774–1855) at Vienna, Nathan Mayer (1777–1836) in London, Karl Mayer (1788–1855) at Naples, and Jacob (1792–1868) at Paris. These branches, though in a measure separate firms, still conduct their operations in common; and no operation of magnitude is undertaken by any without a general deliberation of all at Frankfort. The Naples branch was discontinued in 1860; the two sons of Karl Mayer (Mayer Karl, 1820–86, and Wilhelm Karl) succeeding their childless uncle Anselm at Frankfort. The bold, yet skilful and cautious, operations of the Rothschilds during the troubled political years after 1813 confirmed the fortunes of the firm. Nathan Mayer in particular distinguished himself by his energy and resource. By means of special couriers, carrier-pigeons, swift sailing-boats, etc., he was frequently in possession of valuable information (*e.g.*, the result of the battle of Waterloo) even before the government, and skilfully turned his advantage to account. The Rothschilds do not contemn comparatively small operations; but they are chiefly famous for the enormous loans which they raise and manage for different European governments. In 1822 the five brothers were made barons by Austria; and in 1885 Baron Nathaniel von Rothschild (born 1840) was raised to the English peerage. Lionel Nathan (1808–79), the father of the last-named, was the first Jew who sat in parliament (1858); and various other members of the family have risen to positions of honor and dignity both in Britain and other countries.

Rotifera (rō-tif'er-a), ROTATORIA, or WHEEL ANIMALCULES, a group of microscopic organisms, inhabiting both salt and fresh water, distinguished by the possession of an interior disk-like structure (*trochal disk*), furnished with vibratile cilia or filaments and capable of being everted and inverted at will. The popular name of 'Wheel Animalcules' is derived from an apparent rotatory motion in the cilia which fringe the front disk. Rotifera are found both in a free swimming and a temporarily or permanently attached state; some are parasitic. The body is usually elongated and generally covered with a chitinous skin. The head region is well marked. A highly-specialized digestive system is usually developed, at least in the females. The nervous system is represented by a single ganglionic mass, on which pigment spots, supposed to be eyes, are generally visible. The sexes are found in different individuals; but the males are smaller, and in development entirely subsidiary to the females. Locomotion is carried on by means of the cilia of the trochal disk, which also

serve to sweep particles of food towards the mouth. The first rotifer was discovered in 1702 by Leeuwenhoek; but Ehrenberg and later observers first differentiated them from infusoria and other minute forms of life. Some authorities class them as an aberrant subdivision of the scolecidæ or tapeworms, others as a subdivision of the annelida, and others connect them with the mollusca, or arthropoda.

Rotrou (ro-trö), JEAN DE, a French dramatist, born in 1609; died in 1650. He was the author of thirty-five plays all deservedly popular, the best of which are *Saint Genest*, *Venceslas*, *Don Bertrand de Labrère*, *Antigone*, *Hercule Mourant*, and *Cosroes*. He was patronized by Richelieu and a friend of Corneille.

Rotteck (rot'tek), KARL WENCESLAUS RODECKER VON, a German historian and politician, was born at Freiburg in Baden in 1775. From 1798 till 1818 he was professor of history, and from 1818 till 1832 of law in the university of his native town. In 1819 he was chosen to represent the university in the upper house of legislature, and in 1831 he entered the lower chamber as a popular representative. His bold and uncompromising advocacy of liberal reform and political freedom drew on him the resentment of government and he lost his professorship, but maintained his seat in the legislature until his death in 1840. His best-known work is his *Allgemeine Weltgeschichte* ('General History of the World').

Rottenburg (rot'en-börg), a town of Württemberg, on the Neckar, about 6 miles S. W. of Tübingen, has a Roman Catholic cathedral and an old castle (1216) of the counts of Hohenberg, now a prison. Pop. 7554.

Rotten-stone, a soft stone or mineral, called also *Tripoli*, from the country from which it was formerly brought. It is much used for polishing household articles of brass or other metal. Most of the rotten-stone of commerce is derived, as that of Albany, New York, from the decomposition of siliceous lime stones, the lime being decomposed, and the silex remaining as a light earthy mass.

Rotterdam (rot'ėr-dam), the chief port and second city in Holland, is situated on the Nieuwe Maas or Meuse, at its junction with the Rotte, about 14 miles from the North Sea, with which it is also directly connected by a ship canal (Nieuwe Waterweg) admitting the largest vessels and not interrupted by a single lock. The town is intersected by numerous canals which permit large vessels to moor alongside the warehouses in the very center of the city. These canals, which are crossed by innumerable drawbridges and swingbridges, are in many cases lined with rows of trees; and the handsome quay on the river front, 1¼ miles long, is known as the Boompjes ('little trees'), from a row of elms planted in 1615 and now of great size. Many of the houses are quaint edifices, having their gables to the street, with overhanging upper stories. The principal buildings are the town-hall, court-houses, exchange, old East India House, Boymans' Museum, containing chiefly Dutch and modern paintings, and the government dockyards and arsenal, besides the numerous churches, of which the most conspicuous is the Groote Kerk, or church of St. Lawrence (fifteenth century). The Groote Markt has a statue of Erasmus, a native of the town; and there are fine parks and a large zoological garden. Rotterdam contains shipbuilding yards, sugar-refineries, distilleries, tobacco factories and large machine works; but its mainstay is commerce. It not only carries on a very extensive and active trade with Great Britain, the Dutch East and West Indies and other transoceanic countries, but, as the natural outlet for the entire basin of the Rhine and Meuse, it has developed an important commerce with Germany, Switzerland and Central Europe. The Maas is

crossed by a great railway-bridge and another for carriages and foot-passengers. Rotterdam received town rights in 1340, and in 1573 it obtained a vote in the Estates of the Netherlands; but its modern prosperity has been chiefly developed since 1830. Population, including the former town of Delfshaven, with which it was incorporated in 1886, 462,481.

Rotti, or ROTTEE (rot'tē), one of the Dutch Sunda Islands, separated from the S. W. end of Timor by the Rotti Strait, 5 miles wide; area, 385 sq. miles; pop. about 70,000, ruled by native chiefs under the Dutch resident.

Rottlera (rot'le-ra), a genus of tropical bushes or moderate-sized trees, nat. order Euphorbiaceæ. *R. tinctoria* affords a dye. See *Kamala.*

Rottweil (rot'vīl), a town of Württemberg, on the Neckar, 49 miles S. S. W. from Stuttgart. It has manufactures of gunpowder and locomotives. It was an ancient free town of the empire. Pop. (1905) 9008.

Rotumah (rō'tö-mȧ), an island of the Pacific, nearly 300 miles N. N. W. of Fiji, 4 to 5 miles wide and about 16 long; hilly, of volcanic origin and generally fertile, producing cocoanuts in especial perfection. It was ceded to Britain by the native chiefs in 1879, and is governed by a commissioner as a dependency of the Fiji group. The natives are now Christians, and number about 2600.

Roubaix (rö-bā), a town of France, department Nord, 6 miles N. E. of Lille, is a highly important seat of the French textile industry, remarkable for its rapid growth, most of it being not more than fifty years old. Woolens, cottons and silk or mixed stuffs are chiefly made; also beet-sugar, machinery, etc. In 1804 it had 8700 inhabitants; in 1911 122,723.

Roubillac (rö-bi-yȧk), LOUIS FRANÇOIS, a French sculptor, was born at Lyons in 1695, and settled in England in the reign of George I. In the dearth of native talent which prevailed at that period he long stood at the head of his profession. He executed a number of monuments in Westminster Abbey, the most remarkable being that of *Mrs. Nightingale.* He also produced statues of *Handel, Shakespere, Sir Isaac Newton, George II,* and a large number of portrait busts. He had much skill in portraiture, but his figures are often marred by striving after dramatic effect. He died in London in 1762.

Rouble (rö'bl), a silver coin, the standard of money in Russia, with a legal weight (since Jan. 1, 1886) of 19.99 grammes, equal to about 80 cents of American money. A rouble is divided into 100 copecks. Half and quarter roubles and smaller silver coins are also issued; but in actual circulation there is little but paper money, current at about 30 per cent. below its nominal value. The gold imperial is worth 10 roubles, the half-imperial 5 roubles.

Rouen (rö-äṇ), the old capital of Normandy, now chief town of department Seine-Inférieure, in France, is situated on the Seine, 80 miles from the sea and 87 miles N. N. W. of Paris. It is the seat of an archbishop, and the

Church of St. Ouen, Rouen.

fourth port in France. In its older parts the streets are narrow, picturesque and ill-built, but interesting to the lover of mediæval architecture. The cathedral, erected in the thirteenth-fifteenth centuries, is one of the finest Gothic monuments in Normandy, though it is surpassed in beauty by the exquisite church of St. Ouen, begun in 1318 and finished at the close of the fifteenth century. St. Maclou (fifteenth century) is a fine example of florid Gothic. Among the secular buildings are the Palais de Justice (late fifteenth century), exuberant in decoration; the Hotel de Ville, formerly

a part of the monastery of St. Ouen; the Hotel de Bourgthéroulde (fifteenth century), with fine reliefs; the archbishop's palace; and the distinctive Tour de la Grosse-Horloge (1389). The new Musée, built in 1888, contains a large collection of paintings, chiefly of the French school. The municipal library has 140,000 volumes and 2500 MSS. Rouen is a busy trading place, and has important manufactures of *rouenneries* (a kind of coarse striped or checked fabric) and other cotton goods. It has also manufactures of chemicals, beetroot-sugar, earthenware, confectionery, etc.; and bleach-fields, dye-works, foundries, etc. The channel of the Seine has been deepened and regulated, so that vessels of 21 feet draught can ascend to the extensive harbor and docks. Rouen is the Rotomagus of Roman times. In the ninth century it became the capital of the Northmen or Normans; and after the Norman Conquest it remained in the possession of England till 1204. The English retook it in 1418, but finally lost it in 1449. In 1431 it was the scene of the trial and execution of Joan of Arc. Corneille, Fontenelle, Géricault, and other famous men were natives of Rouen. Pop. 105,043; or including the faubourgs, 124,987.

Rouge (rözh), a very fine scarlet powder, used by jewelers for polishing purposes, and prepared from crystals of sulphate of iron exposed to a high temperature. The name is also given to a cosmetic prepared from safflower (which see).

Rouge Croix (rözh krwä), ROUGE DRAGON, pursuivants of the English Herald's College, the first so-called from the red cross of St. George; the second from the red dragon, the supposed ensign of Cadwaladyr, the last king of the Britons. See *Pursuivant*.

Rouge-et-Noir (rözh-ē-nwär; Fr. 'red and black'), TRENTE-UN (trânt-un; 'thirty-one'), or TRENTE ET QUARANTE (trânt-ē-kârânt; 'thirty and forty'), a modern game of chance played with the cards belonging to six complete packs. The punters or players stake upon any of the four chances: *rouge*, *noir*, *couleur*, and *inverse*. The banker then deals a row of cards for noir, until the exposed pips number between 30 and 40 (court-cards count 10, aces 1), and a similar row for rogue. That row wins which most nearly approaches the number 31, and players staking on the winning color receive their stake doubled. *Couleur* wins if the first card turned up in the deal is of the winning color; in the contrary case *inverse* wins. When the number of pips in both rows are equal it is a *refait*, and a fresh deal is made; but if both happen to count exactly 31 it is a *refait de trente-et-un*, and the banker claims one-half of all stakes. This last condition places the banker at an advantage calculated to be equal to about 1¼ per cent. on all sums staked.

Rouget de Lisle. See *Marseillaise Hymn*.

Rough Riders, a name coined by William F. Cody ('Buffalo Bill'), for use in his 'Wild West' show, indicating the men who carried messages over the West in early frontier times. The name was given to the cowboy regiment organized by Theodore Roosevelt for the Spanish-American war; also to the 2d United States volunteer cavalry. These were made up largely of western ranchmen.

Roulers (rö-lār; Flemish, *Rousselaere*), town of Belgium, in West Flanders, on the Mandel, 17 miles south of Bruges. The chief industrial establishments are cotton and woolen factories; and it has an important linen market. Pop. (1904) 24,548.

Roulette (rö-let'; Fr. 'little wheel'), a game of chance, in which a small ivory ball is thrown off by a revolving disk into one of 37 or 38 compartments surrounding it, and numbered from 1 to 36, with one or two zeros. Players who have staked upon the number of the compartment into which the ball falls receive thirty-six times their stake; less if they have staked upon more than one number. There are also other chances on which stakes may be placed.

Roumania (rö-mā'ni-a), or RUMANIA, a kingdom of Southeastern Europe. After the Balkan wars (1913) it had an area of 53,489 sq. miles; pop. 7,904,104. After the European war (1919) it had, with the addition of Bessarabia, Bukovina, Transylvania, Banat and other territory, an estimated area of 122,280 sq. miles; pop. 17,350,000. The capital is Bucharest, on the Dimbovitza (estimated population in 1919, 400,000). It is bounded by Ukraine, Gallicia, Czecho-Slovakia, Hungary, Jugo-Slavia, Bulgaria and the Black Sea.

In Transylvania the surface is mountainous, with extensive forests and valuable minerals. In old Roumania the surface is mainly occupied by undulating and well-watered plains. The Danube forms part of the boundary with Bulgaria; its tributaries are the Pruth (Prutt), Sereth (Siretu), Kofilnik, Byk, Jalomitsa, Oltu, and many others. The Danube forms a number of marshy lakes as it approaches the alluvial region of the

Dobrudsha, through which it discharges itself into the Black Sea by the St. George, Sulina and Kilia channels. The climate is much more extreme than at the same latitude in other parts of Europe; the summer is hot and rainless, the winter sudden and very intense; there is almost no spring, but the autumn is long and pleasant. Roumania is an essentially agricultural and pastoral state, fully 70 per cent. of the inhabitants being directly engaged in husbandry. The chief cereal crops are maize, wheat, barley, rye and oats, enormous crops of wheat and maize being produced; tobacco, hemp, and flax are also grown; and wine is produced on the hills at the foot of the Carpathians. Cattle, sheep, and horses are reared in large numbers. Excellent timber abounds on the Carpathians. Bears, wolves, wild boars, large and small game and fish are plentiful. The country is rich in minerals of nearly every description, but salt, petroleum, and lignite are the only minerals worked. Manufactures are still in a rudimentary state.

Trade, Railways, etc.— Trade is fairly active, but is almost entirely in the hands of foreigners; the internal trade is chiefly carried on by Jews, whose numbers and prosperity are constant sources of anxiety to Roumanian statesmen, and who are in consequence subject to certain disabilities. The chief exports are grain (especially maize), petroleum, cattle, salt, timber, and fruit. The chief imports are manufactured goods, coal, etc. Great Britain and Germany have by far the greatest share of the foreign trade, the bulk of which passes though the Black Sea ports. Railways, begun in 1869, have a total length of about 2300 miles, nearly all in the hands of government, which also monopolizes salt and tobacco. The French decimal coinage has been introduced, the franc being called *leu* (pl. *lei*), the centime *bani*. The metric system of weights and measures has also been officially recognized, but a bewildering diversity of local standards is still common.

People.— The Roumanians, who call themselves *Romani*, claim to be descendants of Roman colonists introduced by Trajan; but the traces of Latin descent are in great part due to a later immigration, about the twelfth century, from the Alpine districts. Their language and history both indicate that they are a mixed race with many constituents. Their language, however, must be classed as one of the Romance tongues, though it contains a large admixture of foreign elements. The population includes, in addition to the Roumanians, large numbers of Jews and gypsies, and smaller numbers of Bulgars, Magyars, Greeks, Germans and Armenians. Three-fourths of the population are peasants, who until 1864 were kept in virtual serfdom by the boiars or nobles. In that year upwards of 400,000 peasant families were made proprietors of small holdings averaging 10 acres, at a price to be paid back to the state in fifteen years. About 4½ millions of the people belong to the Greek Church. Energetic efforts are being made to raise education from its present low level. Roumania has two universities (at Bukarest and Jassy), several gymnasia, and a system of free primary schools, at which attendance is compulsory.

Government, etc.—Roumania is a hereditary constitutional monarchy, with a bicameral legislature. The Senate (1920) consists of 170 members (Old Kingdom, 82; Transylvania, 45; Bessarabia, 24; Bukovina, 19) including 4 for the universities and 19 bishops. The chamber of deputies consists of 347 members. All citizens of 21 years, paying taxes, are electors. The executive is vested in a council of ministers. Military service is compulsory and universal from the ages of 21 to 46. Roumania mobilized some 700,000 men in the European war. The strength of the army in 1920 was approximately 250,000.

History.— The country that is now Roumania was anciently part of Dacia, which was conquered by Trajan and made a Roman province in 106 A.D., a great many Roman colonists being then settled in it. In the third century it was overrun by the Goths, and subsequently by Huns, Bulgars, Avars and Slavs, all of whom have left more or less distinct traces on the land and people. At the beginning of the ninth century Roumania formed part of the great Bulgarian kingdom, after the fall of which, in 1019, it nominally belonged to the Eastern Roman Empire, although soon taken possession of by Turkish tribes. Wallachia and Moldavia were long divided. About 1241 Radu Negra 'duke' of Fogeras, is said to have founded a voivodeship in Wallachia, which finally fell under Turkish supremacy after the battle of Mohacs in 1526. The boiars retained the nominal right of electing the voivodes until 1726; but thenceforward the sultan openly sold the office to the highest bidders, who, without security of tenure, mercilessly plundered the unfortunate province so long as their power lasted. In Moldavia, Dragosh or Bogdan about 1354 founded a kingdom, much as Radu had done in Wal-

lachia, and it too fell under the overlordship of the Porte after the death of the voivode Stephan the Great in 1504. The Turks subsequently introduced the same custom of selling the hospodarship or voivodeship. In both provinces the government was most frequently purchased by Phanariotes, Greek inhabitants of the Phanar district of Constantinople. The successive wars between Russia and Turkey were on the whole beneficial to Roumania, for the Russians gradually established a kind of protectorate over their fellow-Christians on the Danube. The Treaty of Paris in 1856, after the Crimean War, confirmed the suzerainty of the Porte, but preserved the rights and privileges of the Danubian principalities, and added to them part of Bessarabia. In 1858 the two provinces, each electing Prince Couza as its hospodar, were united by a personal union, which in 1861 was formally converted into a real and national union. Couza, who assumed the title of Prince Alexander John I in 1860, was forced by a revolution to abdicate in 1866, and Prince Charles of Hohenzollern-Sigmaringen was elected in his place. In the Russo-Turkish War of 1877-78 Roumania sided with Russia, and proclaimed its independence of Turkey. This claim was recognized by the Treaty of Berlin in 1878, but Roumania was compelled to retrocede to Russia the part of Bessarabia which it acquired at the close of the Crimean War, and to receive the Dobrudsha in exchange. In 1881 the principality declared itself a kingdom. Roumania joined in the Balkan war in 1913 (q. v.). King Charles died October 10, 1914, his nephew, Ferdinand, succeeding. Roumania remained neutral in the European war until August 28, 1916, when it joined the cause of the Entente Allies. It made a brief successful forward movement, but a complete repulse followed, the whole country being overrun. With Russia, Roumania was compelled to sign a treaty of peace in March, 1918, with Germany and her allies. With the collapse of the central powers in November, 1918, Roumania reentered the war, and was represented in the peace conference in Paris. By the peace of 1919 her territory was nearly doubled, at the expense of Hungary and Russia. (See map of Balkan States.)

Roumelia. See *Rumelia.*

Round, in music, a short composition in which three or more voices starting at the beginning of stated successive phrases sing the same music in unison or octave (thus differing from the canon).

Rounders (roun'dėrz), a game played with a bat and a ball by opposing teams on a piece of ground marked off into a diamond. Nine play on each side. It is very similar to baseball, which superseded it in America, though the game in its original form of rounders is still popular in England.

Round-fish, a fish (*Coregŏnus quadrilaterālis*) of the salmon family, found in many of the lakes and rivers of the Northern United States and Canada. When in good condition it is very fat and of exquisite flavor, weighing about 2 lbs.

Roundheads, a name formerly given by the Cavaliers or adherents of Charles I, during the English civil war, to members of the Puritan or parliamentary party, who distinguished themselves by having their hair closely cut while the Cavaliers wore theirs in long ringlets.

Round Robin, a written protest or remonstrance, signed in a circular form by several persons, so that no name shall be obliged to head the list. This method of bringing grievances to the notice of superiors was first used by French officers, whence its derivation from *rond ruban*, 'round ribbon.'

Round Table, The, famous in the Arthurian legends, a table for the accommodation of a select fraternity of knights, said to have been established by Uther Pendragon, father of King Arthur, and when it was complete to have had 150 knights of approved valor and virtue. King Leodegraunce, who received it from Uther Pendragon, was father of Guinevere, and assigned it as part of her dowry when she wedded Arthur. The fellowship of the Round Table met for the last time just before setting out on the quest for the holy grail. There are other accounts of the founding of the table, one of which ascribes it to Arthur himself, who admitted only 12 knights to it. All, however, unite in describing it as the center of a fellowship of valiant, pious, and noble knights. First mention of it is made in the Brut of Wace.

Round Towers, a class of tall narrow circular edifices, tapering somewhat from the base upwards, and generally with a conical top, from 60 to 130 feet in height, and from 20 to 30 in diameter. With the exception of three in Scotland, they are peculiar to Ireland. The doors are from 6 to 20 feet from the ground, the windows small. They are presumed to have been the work of Christian builders, period of 8th to 13th century.

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